

5 WONDERFUL WEEKEND HOMES

Popular Mechanics

MAY 1973
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BONUS**

COMPLETE CAR CARE GUIDE

The know-how you need to put your car
in top shape, keep it running smooth
and looking new.

Popular
Mechanics
**Car Care
Guide**



This 1260-square-foot A-frame is one of PM's

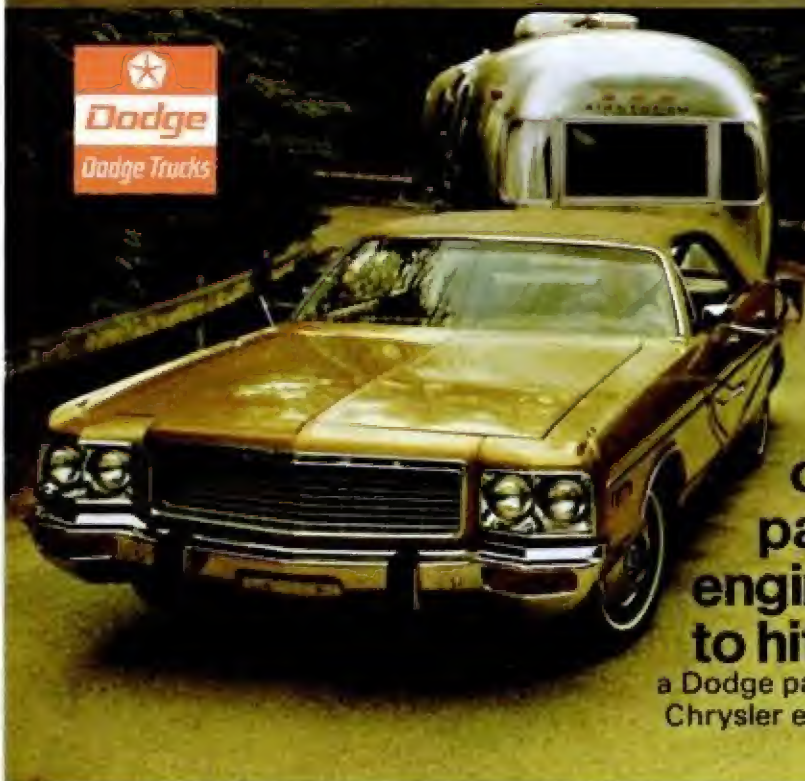
5 GREAT VACATION HOMES

CLIP & SAVE KNOW-HOW:

- How to wire a yard light
- How to silence squeaky floors
- How to hang shelves
- How to repair a damaged roof

Dodge is America's Number 1 Builder of Mini Motor Home Chassis.

Dodge pioneered the development of the cutaway mini motor home chassis. Only Dodge offers all these benefits: dual rear wheels, the longest wheelbase—145", power front disc brakes, the most powerful V8 engine, and Chrysler-engineered Electronic Ignition.



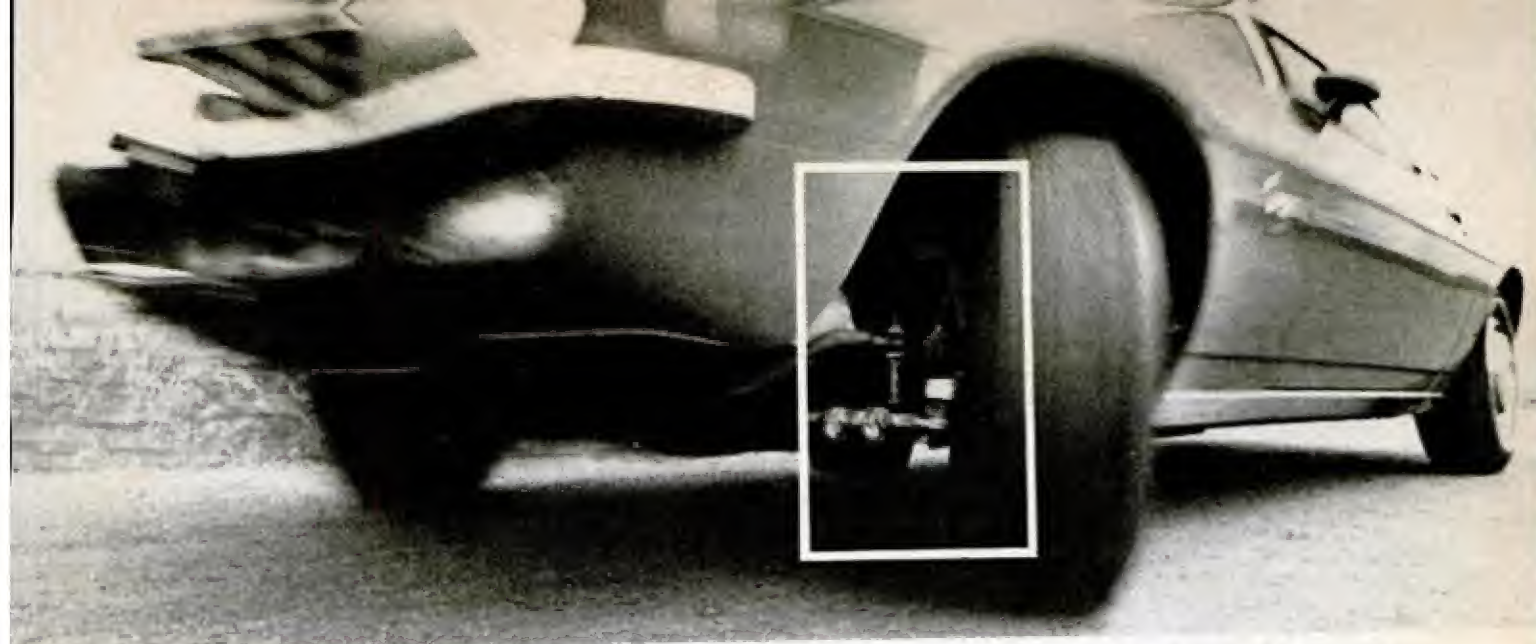
The big Dodge offers a trailer-towing package that is factory-engineered from bumper to hitch platform. Every item in

a Dodge package has been selected and tested by Chrysler engineers. These packages are available for trailer loads up to 7,000 pounds.

Turn to Dodge for leadership in Recreational Vehicles.

FOR LEADERSHIP IN R.V.S...





No matter how well your car handles, it's going to get worse!

Introducing SHIMMY STOP... the do-it-yourself compound that keeps ball joints from causing uneven tire wear, sloppy handling and dangerous loss of front-end precision!

NO MATTER HOW WELL YOU MAINTAIN YOUR CAR, the ball joints on the front-end wear mile after mile, and get looser until tires wear unevenly, the steering wheel starts to shimmy, and the front-end won't hold an alignment.

REPLACING BALL JOINTS IS COSTLY, often costing up to \$100.00. But until now, that was the only way to solve the problem.

NOW THERE'S SHIMMY STOP... a compound that restores worn ball joints still within manufacturers replacement tolerances... without the cost of ball-joint replacement!

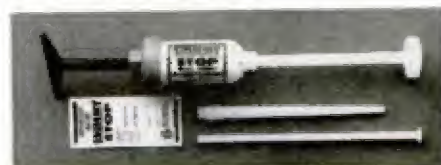


Here's how SHIMMY STOP works... how it actually reduces ball joint tolerances to zero:

1. SHIMMY STOP is mixed in its cartridge and injected into the ball joint via the existing grease fitting.
2. Inside the ball joint, SHIMMY STOP fills the worn area between ball and socket... reducing the tolerance to zero...

3... once the ball joint is sealed with the plug provided, the compound cures to a tough, self-lubricating solid.

SHIMMY STOP COMPOUND comes in a cartridge that acts just like a grease gun. The handle, nozzles, plugs, instructions and specifications are included. And there's a special sticker to note the mileage when SHIMMY STOP is installed.

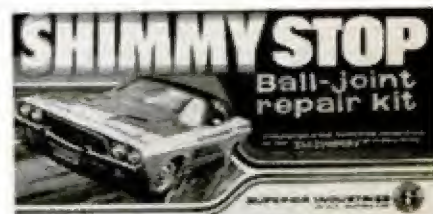


SHIMMY STOP has been tested for years in private and fleet cars... and performance proved by a private automotive testing agency for more than 1,250,000 miles.

THIS FREE BALL JOINT GAUGE shows how badly worn the ball joints are and if you should use SHIMMY STOP or replace the ball joints.



WHAT HAPPENS WHEN YOU USE SHIMMY STOP? Front-end alignment holds longer... tires wear more evenly, steering becomes safer, more precise... a new car feeling comes back to your car.



SHIMMY STOP... developed, tested and proven by 3M Company research... and distributed by Superior Industries. Write for your free ball joint gauge now. And, ask about SHIMMY STOP at your favorite auto supply store.

SHIMMY

This One



W7WX-4H5-OD15

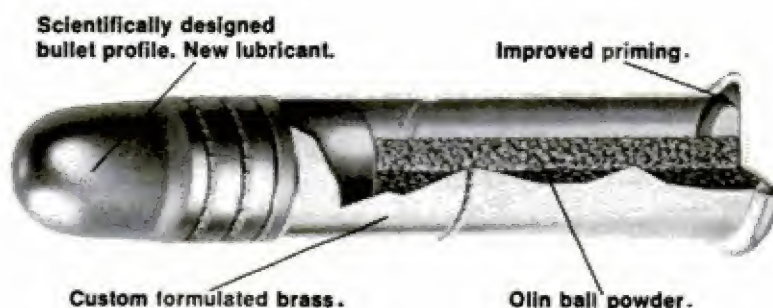
Popular Mechanics
PRODUCT FEATURE



SUPERIOR INDUSTRIES
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Van Nuys, California 91405

Winchester and Western T22 rim fires put 'em right where you hold 'em for the 22 rim fire sports you enjoy most: targets, tin cans, or tough game.

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What does T22 stand for? The "T" in "T22" stands for "Target" as in "Accuracy." That's because Winchester and Western people know from many lifetimes of plinking pleasure that no matter what you're aiming at . . . a tin can on a log . . . a wily crow in a cornfield . . . or the standard NRA target in a formal match . . . every shooter expects a high degree of accuracy from a 22 rim fire load. That's where new T22s come in, with performance and accuracy that's strictly premium . . . but at a price that gives you plenty of opportunity for practice. T22s are available in either Winchester or Western brands, and come in both Short and Long Rifle. And they come through with what every 22 shooter wants most: Target-like accuracy for every 22 rim fire sport you enjoy most . . . at no increase in price.

All-around performance and accuracy.

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game or pests. You get a lot of action, too, when you're just popping cans in a safely-backstopped sandpit. And you stay in top form for the big target matches, without top expenditure. T22s are the finest all-purpose rim fires you can buy.

Target-quality components. The reason for T22s' outstanding value and performance can be found in the top-quality components that make up every cartridge . . . and the same quality-control precision that helps make Super-X power loads, and our largest center fire ammunition. Bullets are exactly shaped for superior wind-bucking accuracy. A special, dry lubricant keeps T22s clean and ready, even if you pick 'em out of your pocket to chamber up. Powerful, clean-burning Olin Ball Powder provides all the zip you need. And consistent, non-corrosive priming ensures both instant ignition, and tight groups at all reasonable rim fire 22 ranges. Slip a box of T22s into your shooting jacket today.

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STERN DRIVES

COMMAND POWER LINEUP FOR '73: 120, 140, 160, 180, 225, 255 HP. For nearest MerCruiser dealer, see the Yellow Pages under "Outboard Motors." Mercury Marine/Division of Brunswick Corporation, Fond du Lac, Wisconsin/Canada/Australia/Belgium

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Illustration by Carl Lauersen

WORTH WRITING FOR: SEE PAGE S84

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Because of possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects that result from plans published in this magazine.

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Stanley's Drill Guide has you going straight.



What can this new tool do for you? Guide your electric drill to a perfect right angle into metal, wood or plastic.

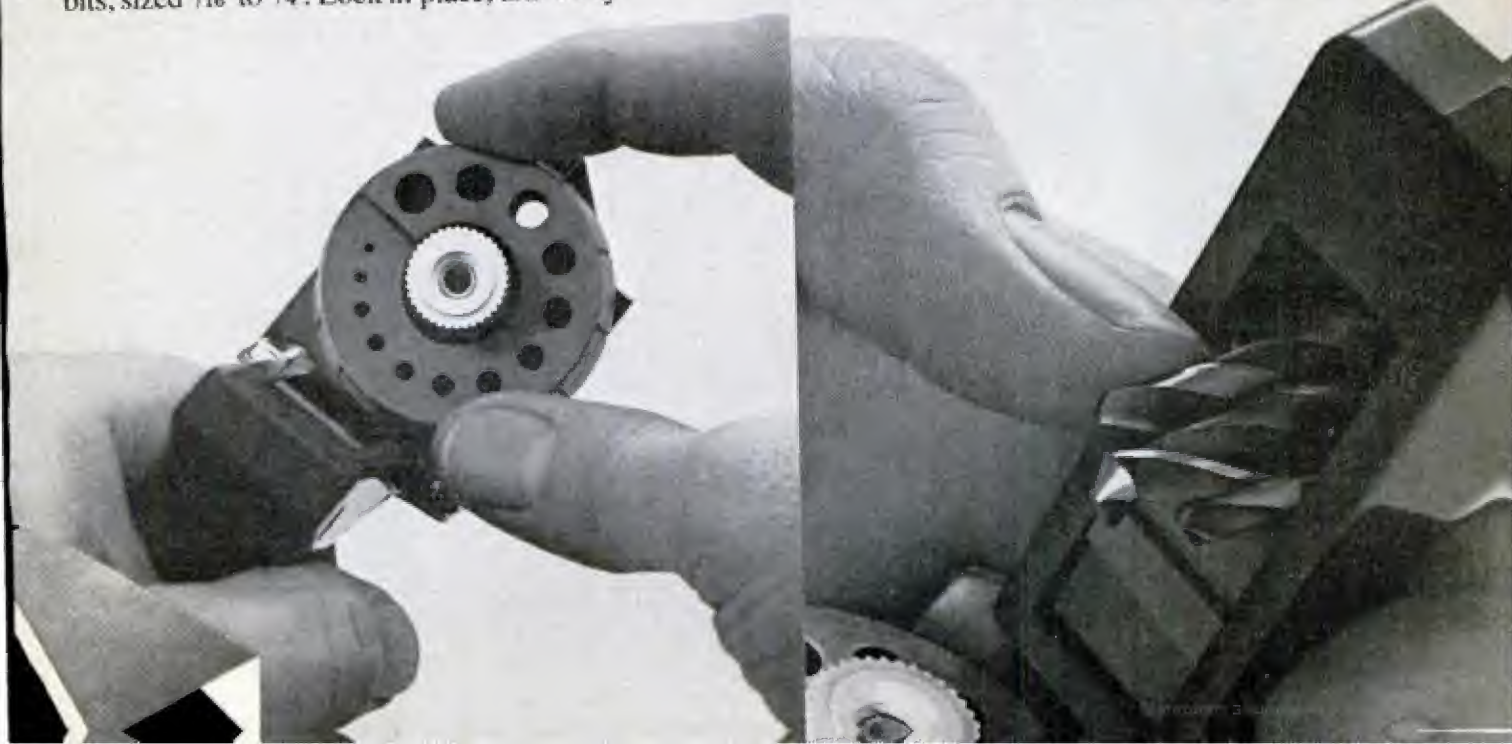
Just rotate the dial on the Drill Guide to the desired bit size. It accommodates 13 different bits, sized $\frac{1}{16}$ " to $\frac{1}{4}$ ". Lock in place, drill away!

STANLEY
helps you do things right



Draw a few grid lines — insert your drill bit and go to town! Drill Guide won't let the bit skitter about or mar the surface.

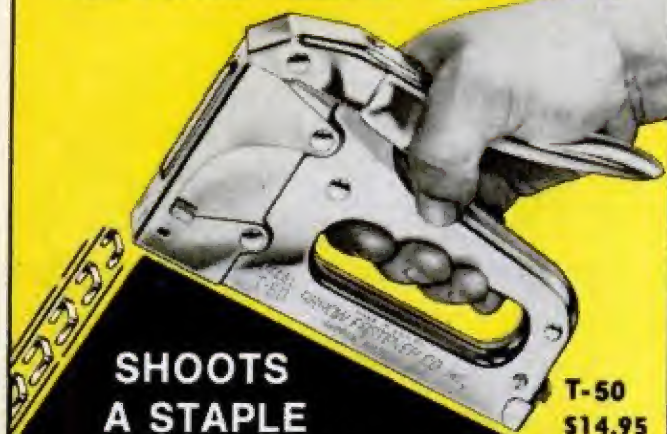
Handy sliding door storage in the handle keeps extra bits available. About \$2.99 for a tool every drill owner will appreciate.



ARROW

HEAVY DUTY T-50

STAPLE GUN



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for fastening light insulation, roofing papers, electrical wires, weatherstripping, wire mesh, etc.



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POPULAR MECHANICS

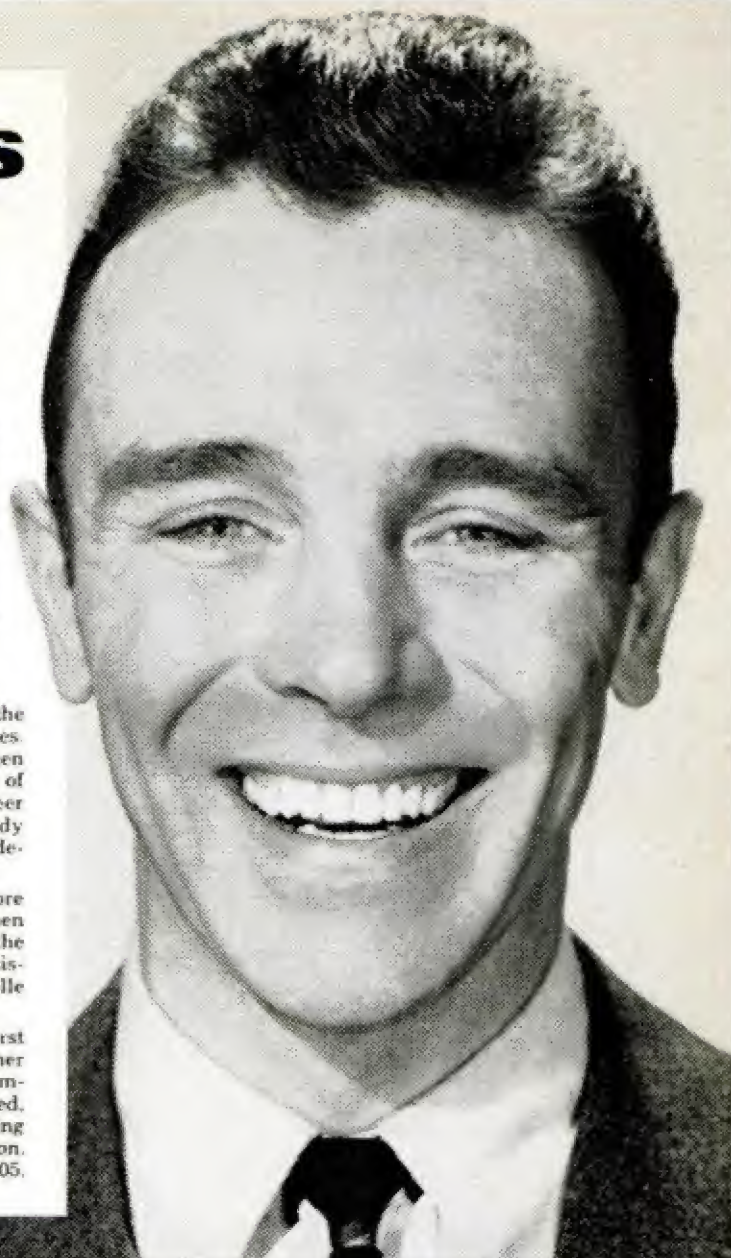
"Look who's smiling now!"

Sometimes a man sets his ambitions high enough to make skeptics smile. But how often he gets the last laugh! "At the time I started studying with LaSalle, I was working as a factory clerk. Before completing the course I was transferred to cost accounting and my salary was increased by \$1800. Now, having completed the course, I'm in charge of the department and headed for the five figure bracket. LaSalle's course helped me pull myself out of a boring and ill-paid job into a position of almost unlimited opportunity."

The words in quotes come directly from one of the pleased reports that are sent to us by LaSalle graduates. LaSalle files contain many letters from men and women who have increased their earnings with the help of LaSalle training. You, too, can prepare for the career opportunity of your choice through LaSalle home study—without interfering with your present work—and by devoting only a little of your spare time.

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9

Power Steering and Tilt-Wheel Steering. Put more recreation in your recreational vehicle.



Here's a comfort-and-convenience package that can help put more pleasure in your camping.

For years, you've enjoyed **Power Steering** in your family car. Now, try it in your GMC or Chevrolet camper. The effect is the same. Parking is easy, handling is smooth (even on rough back roads), so there's less work for you at the wheel.

The second half of the team is **Tilt-Wheel Steering**. People like it so well on cars, we've made it available for campers.

With Tilt-Wheel Steering, you can flick a lever and move the steering wheel up or down to a wide range of settings. "Up" helps make getting in and out of your camper easy. "Up" and "down" help make long trips less fatiguing because you can change the steering wheel position. Change it as often as you want as you drive. Without pulling off the road.

Power Steering and Tilt-Wheel Steering. Your GM dealer will be glad to give you a demonstration.

**Saginaw Steering Gear Division,
General Motors Corporation**

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TILT-WHEEL STEERING



LETTERS TO THE EDITOR

Sewing centers

I can't recall seeing an as well illustrated, written and technically designed shop feature as *Sewing Centers—The Kind Women Want but Can't Buy* (page 77, March PM). I would encourage you to continue with that approach in presenting various designs for office furniture, household furniture and shelf units.

ROY, UTAH

NORMAN H. MALONE

We're encouraged. Keep watching.

Wrong-way rotation

How to Stop an Engine That Won't Stop (page 144, Feb. PM) was very timely since many owners of late-model cars are aggravated by this problem. Your author did make one slip, though, when he said, "Turning the distributor against the rotor rotation retards timing." This will advance the timing.

FRANKFORT, KY.

JIM JUDGE

You're right—and we're guilty of a wrong-way turn.

Gone but not forgotten

The first page I like to read in PM is *New Inventions*, and I couldn't find it in my February issue. I can't believe my eyes. Have you deleted it?

DOWNSVIEW, ONT.

N.H. LUK

That feature is gone, but we haven't forgotten it. Inventions that formerly appeared under that heading are now incorporated into our new, 12-page department, It's New Now. We found so much duplication between the two departments that we felt it necessary to combine them.

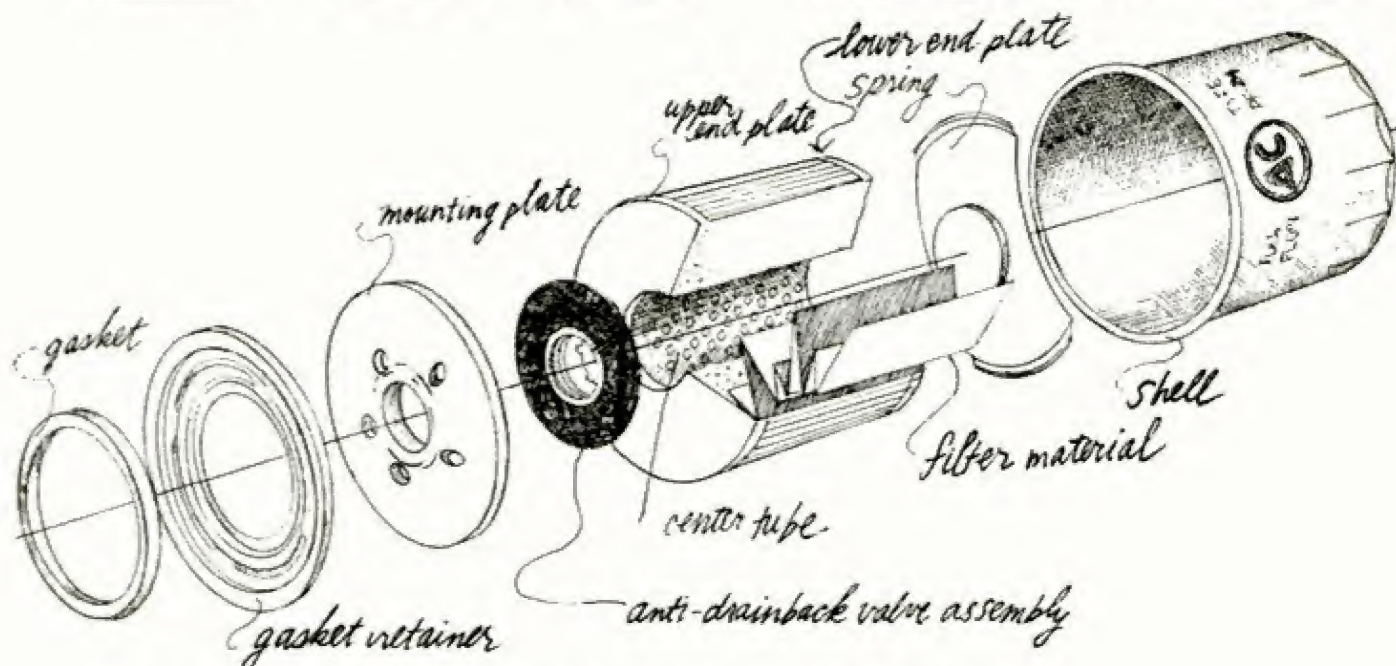
Good frames for good art

When I operated a small framing business in conjunction with a photo studio some years back, I certainly could have used some of the good ideas for framing you presented in *Good Art at a Price You Can Afford* (page 73, Feb. PM). I hope to

(Please turn to page 10)

POPULAR MECHANICS

TOUGH!



AC Oil Filters are built tough... to help keep your engine running clean

Oil filters are subjected to extreme engine oil temperatures and pressures. To provide efficient filtration in these extremes, the filter must be built tough. Here's how AC does it:

GASKET RETAINER—welded to the mounting plate and lock-seamed to the shell to provide a mechanically locked, leakproof assembly.

MOUNTING PLATE—heavy-gauge steel to help eliminate movement at the gasket sealing surface to prevent leakage.

ANTI-DRAINBACK VALVE ASSEMBLY—spring-loaded to help prevent oil from draining out of the filter when the engine is off . . . assures oil ready for start-up.

CENTER TUBE—perforated steel provides support for filter material . . . helps prevent collapse under high oil pressure.

FILTER MATERIAL—resin-impreg-

nated, polyester-reinforced filtering media helps provide reliable protection. AC's "W-Fold" design provides a large filtering surface area.

SHELL—a heavy-gauge steel enclosure . . . features a "15 flat" design for easy removal.

There is a difference in oil filters . . . AC's engineering and manufacturing know-how makes the difference. One more reason it'll pay you to go with the "tough one" for your car . . . an AC Oil Filter.

AC is the original equipment oil filter for GM cars . . . and the replacement oil filter for all American-made cars, and most imports. So next time you change your oil filter, whether you do it yourself or have it done, insist on AC.

AC Oil Filters are available at more retail outlets than any other brand.*

*Based on the results of an independent survey.



AC keeps you going when the going's tough



AC SPARK PLUG DIVISION

LETTERS

(Continued from page 8)

use some of the ideas at the first opportunity.

POMONA, CALIF. C.E. (DOC) BANISTER

The picture-framing feature is just outstanding—the best I have ever seen.

PORTLAND, ORE. W. D. GAITTENS

You don't really need some of the tools you mentioned. In my shop class we had to make a frame. All we used was a hacksaw, miter box, pencil, ruler, glue, string and combination square. Some students used hammer and nails. I'm the only girl in the class, and I used the glue and string and impressed some of the guys who used hammer and nails.

MIAMI LAKES, FLA. LIZABETH GOMERSALL

I enjoyed your excellent framing article. However, as a professional framer, artist and restorer, I know a few readers will decide they are "pros" based on their success and the discovery that making frames is really quite simple and easily mastered. They will feel quite competent to tackle any piece of art.

You state in your article that you used prints and reproductions. The trouble is that some materials you use with valueless prints and reproductions will damage art that has real or potential value. For example, pastels and charcoals can be ruined if placed directly next to glass or if plexiglass is used.

Two years ago, concerned professional framers and the industry joined to form the national Professional Picture Framers Assn. One of the group's purposes is the dissemination of good technical information. I urge anyone interested in framing as a business to join. Membership is \$25 a year. The address is P.O. Box 9345, Jackson, Miss. 39206.

CARY, N.C. M. C. JAMISON

You did not give the city in which one listed source—Marboro Books—is located.

CROWN POINT, IND. MRS. DANIEL THOMAS

It's Marboro Books, Dept. PM, 205 Moonachie Rd., Moonachie, N.J. 07074.

Big pencils

Items K, J and B in *New Irons for Bet-*

ter Soldering (page 111, March PM) are certainly not new.

On page 113, your author says, "Soldering guns are widely used for heavy soldering . . ." That is not so because a heavy copper mass or tip is required for heavy jobs, and a gun does not have this requisite. On page 114, the article states, "Pencil irons come in a variety of sizes, from 20 to 600 watts . . ." It would take an electrical miracle to put 600 watts in a pencil iron.

WESTBURY, N.Y.

ROGER LUNEAU

You're right in saying all items are not new; we wanted to show the widest range of currently available equipment. As to soldering guns, we'd have been better advised to call it medium to medium-heavy soldering (e.g., soldering a small wire directly to a big chassis).

We used the term "pencil" primarily to refer to shape. Admittedly (and as the photo on page 111 shows), by the time you get up to 100 watts or more, you could more accurately describe it as a "club." But the term "pencil" is occasionally used even for big irons; the term "club" is never so used.

High style

I made slight modifications to my *High-Style Table From Construction-Grade*



Lumber, (page 140, July '72 PM) —like tapering the supports to eliminate a knee-knocker and cutting the bench into three sections. Apparently lumber is more expensive in Virginia than Minneapolis; lumber alone was close to \$45.

MCLEAN, VA.

JAMES C. LINK

Who knows about windmills?

I have been trying in vain to get information on windmills—relative efficiencies

(Please turn to page 13)



This is a stripped-down Subaru Station Wagon

Here's what you get:

1. Front wheel drive.
2. AM pushbutton radio.
3. 4-wheel independent suspension.
4. New 1400cc quadrozontal engine.
5. Whitewall radial tires.
6. Rack and pinion steering.
7. MacPherson Strut front suspension.
8. 4-speed synchromesh transmission.
9. Tinted glass all around.
10. Economy—up to 30 mpg on regular.
11. Fully-reclining, high-back bucket seats.
12. Undercoating and nylon carpeting.
13. Cigarette lighter.
14. Flow-through ventilation.
15. Heater and defroster.
16. Impact-absorbing steering wheel.
17. Bumpers that qualify for insurance discount.
18. Fire-retardant upholstery.
19. Recessed door locks.
20. Hatch & tailgate for height & low-lift loading.
21. Floor-to-dash center console.
22. Adjustable heavy-duty suspension.
23. Dual diagonal brake system.
24. Styled wheel covers.



This is a fully-equipped Subaru Station Wagon

Here's what you get:

1. Front wheel drive.
2. AM pushbutton radio.
3. 4-wheel independent suspension.
4. New 1400cc quadrozontal engine.
5. Whitewall radial tires.
6. Rack and pinion steering.
7. MacPherson Strut front suspension.
8. 4-speed synchromesh transmission.
9. Tinted glass all around.
10. Economy—up to 30 mpg on regular.
11. Fully-reclining, high-back bucket seats.
12. Undercoating and nylon carpeting.
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39⁹⁵



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19⁹⁵



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Windshield Wiper
Delay Control Kit
12⁹⁵



Driver Alert
Radar Sentry Kit **24⁹⁵**



SCR Electronic
Ignition System Kit
12⁹⁵

Capacitive discharge ignition system puts more power in your car, cuts maintenance and boosts gas mileage!

Auto analyzer measures rpm, volts, amps, ohms, dwell angle, plus spark output and leakage.

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SCR ignition system electronically fires spark, extends dwell angle for improved power.



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LETTERS

(Continued from page 10)

between fan type, turbine or vertical rotors; also horsepower curves for various wind velocities. Can your readers help me? OSTERVILLE, MASS. JOHN E. BARNARD JR.

If any reader can, we'll forward your letter to Mr. Barnard.

Those wild wings

I was glad to learn from *Those Wild New Wings: Will They Really Fly?* (page 124, March PM) that aerodynamicists have finally laid to rest the myth of "suction," an obviously nonexistent force and a theory that pilots never willingly accepted.

RANDLEMAN, N.C. ROBERT G. VAUGHN

We really did not imply that the theory of the Bernoulli effect had been laid to rest. Our article stated that one aerodynamicist theorizes that lift comes mainly from the ram effect of air hitting the underside of a wing and that low-pressure "suction" on the top is secondary.

There are three effects which combine to produce lift on an airplane wing, and none of the three may be neglected in lift computations without producing large errors.

Certainly the bottom surface of the wing pushes air down "water-ski" fashion; this allows flat plate airfoils to produce lift.

The "old theory"—that of the low pressure on the upper surface caused by the faster flow above the wing—is necessary, too. This effect explains why flat-bottom airfoils, such as the famous Clark Y section, can produce lift without having a positive angle of attack.

The third mechanism of lift is called circulation. The manner in which circulation, in conjunction with linear flow, produces lift is called the Magnus effect; this is the same effect that makes a baseball curve.

When an airplane flies inverted, the "water-ski" effect is more important than the suction effect (suction being most important while upright), but all three effects continue to function. The only consequences are lower maximum available lift and higher drag.

ROCHESTER, N.Y. R. GREGG LOVICK

Indexes still available

Please send me the 1971 Index. I am well satisfied with the one for 1972.

WARWICK, R.I.

ED BATES

We can still fulfill orders for the 1971 and 1972 Indexes. They're \$1.49 each from Popular Mechanics, Box 1014 (Dept. PMI), Radio City, N.Y. 10019. Be sure to state which year you want.

Price of benchtop vise

We'd appreciate your help in clarifying the discrepancy in the price of the Bench Holdfast (Benchtop Vise, page 136, Dec. '72 PM). The price now is \$10.90 ppd. WOODCRAFT SUPPLY CORP. ABIGAIL ARNOLD WOBURN, MASS.

Sorry, bad timing. We were using one catalog when a new one was on the way.

It isn't Morse code

PM contributors, like everyone else, are fouled up with reference to the code used for radio transmission.

In the December issue, on page 86 (*Little Boats That Go Out to Save Big Ones*) and page 123 (*Two-Way Radio—Tool or Toy?*) it's referred to as Morse code. What they are talking about is International code—sometimes (mostly in the past) also referred to as Continental code.

If someone memorizes Morse code and attempts to use it for radio transmission, he's in for a rude awakening. Eleven letters and all of the figures and punctuations are different.

EAST PETERSBURG, PA. R. T. McCLEARY

Watch out with high-speed infrared

Just a caution about *Build This Fold-away Film Dryer* (page 56, Dec. '72 PM).

You say it can be used while you're doing other darkroom work. Perfectly true, but if you're working with high-speed infrared film, watch out! The long-wave infrared the dryer puts out wouldn't affect regular infrared film, but it might fog high-speed infrared film which has a sensitivity extending farther down into the longer infrared range.

SWISHER, IOWA

ROBERT D. SMITH

Though not many readers are likely to be working with high-speed infrared, we'll pass along your warning. ★★★

Photo Hints



Jug keeps film cool on trips

A wide-mouth, insulated jug can keep your film cool in the summer and warm in the winter. The plastic-foam type is best because of its light weight. Just keep the jug open in your airconditioned or heated room at night, and close it in the morning.—*Parry C. Yob, Fair Oaks, Calif.*



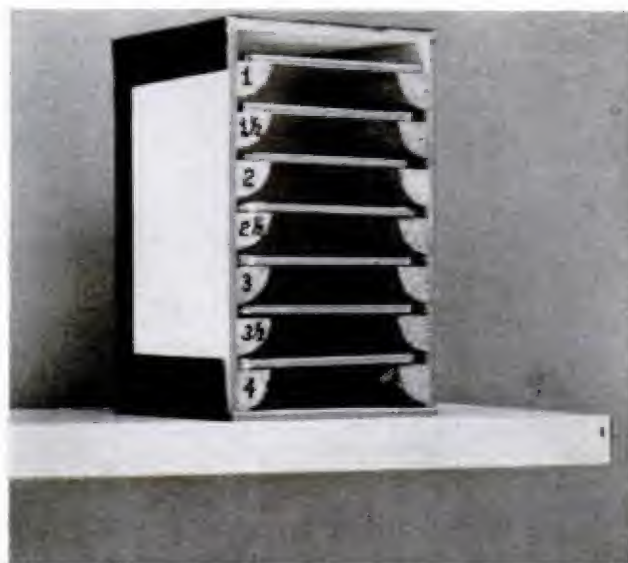
Bleach bottle speeds tank filling

Cut a thoroughly washed plastic bleach bottle in half, and the bottom makes a container big enough to fill your developing tank from. Use a graduate to measure out the proper amount of solution, then draw a fill mark and label the volume on the outside with a brush pen or felt marker. The thin plastic feels flimsy, but when you pour, it conveniently deforms to make its own pouring lip. The bottle's upper half makes a handy funnel, complete with a convenient handle. Two gadgets from one bottle.—*Parry C. Yob, Fair Oaks, Calif.*



Clothespin clip for thermometer

A darkroom thermometer is easier to see if it's fastened with rubber bands to a plastic clothespin (wood ones absorb chemicals) and clipped to the side of your tray.—*Ken Patterson, Regina, Sask.*



Easy enlarging filter rack

Mounting board and small pieces of quarter-round molding make a neat rack for storing enlarging filters for variable-contrast papers. —*Val Hawes, Brea, Calif.*

POPULAR MECHANICS



Labeled lid stops contamination

To prevent accidental contamination of your photo chemicals, label your storage-bottle caps—not just the bottles themselves. Raised-letter labelmakers can also add developing or mixing information to the bottles.—*Van Bergen, New York.*



Clipboard and vise make copy stand

A vise and clipboard make a good, impromptu copy stand. Use a rubber band to hold bottom of paper flat to the board.—*Marshall Lincoln, Wickenburg, Ariz.*

You can feel the difference.

Just holding this sturdy, lightweight little camera gives you the feeling that now, at last, you can take great pictures. Anywhere. Any time. The Minolta Hi-matic F has a balance, a construction, a "feel" that inspires confidence. Since the "F" is an amazing electronic instrument that does everything for you except focus, the results invariably prove worthy of the confidence it inspires.

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The Electronic
Minolta Hi-matic F



JUNE Preview OF POPULAR MECHANICS

Best bikes you can buy

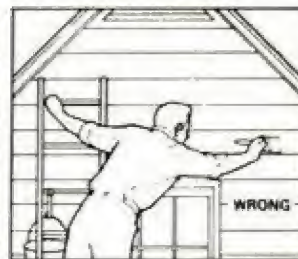


Whether you're looking for a bicycle for yourself or your 3-year-old, whether you can pay under \$100 or over \$250, bike expert Eugene

Sloane has one picked out for you. The June PM shows 19 great buys.

How to use a ladder

Painting the house? You'll need the tips in this article on how to carry, erect and work from a ladder. And *How to paint your house* will help you with the important preparation work and proper painting steps to insure a beautiful, long-lasting job.



PM's perfect fishing machine

Everything the offshore fisherman needs in one boat—from wave-taming tabs to lunker-locating electronics—is previewed.



How to work magic with moldings

Stock moldings offer you limitless ways to customize your home. We show you how they make possible beautiful paneling jobs.



What it's like to soar

An experienced sailplane pilot takes you on a typical flight and tells how you can get into this growing sport.

PLUS

Low-cost outdoor furniture you can build
 • The new life preservers you'll need for your boat • How to repair a doorbell
 • Car stereo units you build from kits • Swimming pool filter you can make • Weatherproof shelter for your portable grill
 • Owners tell what they like—and don't like—about the Plymouth Satellite and Buick Electra • Solar heating for houses

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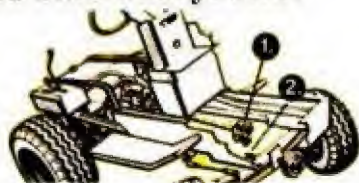
On new subscriptions, first copy will arrive in about 8 weeks.

(Above prices apply in U.S. and Possessions only. Canada, add \$2 per year. All other countries, add \$4 per year.)

WPM3E1

At last! Garden tractors built for long life, quick hook-ups ^(without belts!) and easy riding — backed by a solid, no-nonsense warranty.

If you could look inside this New Holland garden tractor, you'd like what you see:



A direct-drive power system (1) to rear wheels. No old-fashioned belts!

A power-take-off shaft (2) replaces belt connections for attachments—makes hook-up surprisingly simple.

By eliminating these belts, New Holland 12 hp., 14 hp. and 16 hp. garden tractors save you trouble from slipping belts and adjusting belts and replacing belts. You get a modern, reliable power system. And, of course, attaching the mower is easier than ever—you don't even need tools.

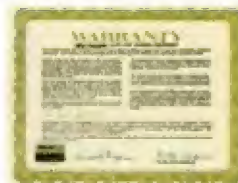
coupling. No more struggling to slide it underneath. The longer you own this tractor the more you'll appreciate this idea.

You'll also appreciate how easy we've made routine maintenance. The front hood and rear deck tilt up easily.

drostatic drive handle (one control for forward, reverse, stopping — without clutching) is right where your hand rests naturally. A hydraulic lever (optional on 12 hp. model) lets you raise and lower attachments effortlessly. It makes work almost a pleasure.



NEW 16 hp. model. Options include mower, snowthrower, tiller, more.



Our warranty shows our confidence. No nonsense. No loopholes. It covers everything except tires, tubes and battery—for one year. That means engine, transmission, electrical system—the works.

Who's Sperry New Holland? We're a division of Sperry Rand. We've been doing business since 1895, mostly with farmers. The fact is, we're the country's #1 producer of specialized farm machinery. We build machines that work hard and last long, you can be sure of it.

Now look at our drive-over mower. You ride right over it to get it in position to connect the power



Easy riding begins with our step-thru platform. There's no big hump to climb over: You step aboard like a gentleman (or a lady). Sit down in the deluxe cushioned seat. The hy-



FREE BUYER'S GUIDE. For your copy, write to Dept. 145, Sperry New Holland, Division of Sperry Rand, New Holland, Pa. 17557. For the name of the New Holland dealer nearest you, phone toll free 800/447-4700. (In Ill. 800/322-4400.)

SPERRY NEW HOLLAND

Now is the best time to buy a New Holland garden tractor (or riding mower). **Why?** Turn the page.

Buy now and select a great gift! See your New Holland dealer.

Buy a New Holland garden tractor (or riding mower) between April 2 and June 30, 1973 and we'll reward you with a bonus gift at no extra cost.



BUY A 12 HP., 14 HP., OR 16 HP. MODEL AND SELECT ONE OF THESE:

Personal Calculator by Sperry Remington. An electronic marvel! Adds, subtracts, multiplies, divides, and flashes answers—up to six figures—on display panel. Works on four penlight batteries. Fits in your pocket. Complete with zip carrying case.

Quiet-riter™ Typewriter by Sperry Remington. For every family! The portable typewriter that gives office-machine performance.

GE® Digital Clock Radio. Wake up to music! FM/AM reception. Brightly lighted one-inch numbers.

Sleep switch to shut off radio automatically.

Crescent® Tool Set. Ideal for the auto buff! Contains 50 pieces: wrenches, screwdrivers, $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ " square drives, spinner handle and extensions, spark plug socket.



WHEN YOU BUY AN 8 HP. TRACTOR, TAKE YOUR PICK HERE:



Mark III Shaver by Sperry Remington. Super-close shaves! Deluxe cord model has adjustable heads plus sideburn trimmer.

Kodak Instamatic® 20. The little camera that takes big pictures! Slips into your pocket. Takes big $\frac{3}{4}$ " color prints or slides. Double-exposure prevention.

GE® FM/AM Portable Radio. Carry it everywhere! Plays on batteries

or house current. $\frac{3}{4}$ -inch dynamic speaker. Earphone jack for personal listening.

Crescent® Tool Set. Professional quality! Has seventeen sockets, with $\frac{3}{8}$ " drive, ratchet handle, wrench, pliers, more. All in steel carrying case.



RIDING MOWER BUYERS CHOOSE FROM THESE GIFTS:



Hot Comb™ by Sperry Remington. For today's dry, natural look! Gives you 20% more air flow. Includes brush and two combs.

GE® Spherical Radio. A fine AM battery radio—and a great conversation piece! The "Orbiter" model spins freely but weighted base always brings it upright. Can be wall-mounted.

Springfield® Weather Station Trio. Know what's happening—and what's coming! Thermometer,

barometer, humidity meters mounted on walnut-grained panel. Adjustable for vertical or horizontal hanging.

Crescent® Socket Set. Makes many home and auto jobs easy! Handy $\frac{1}{4}$ " drive set with 9 sockets, ratchet handle, 2 extensions. Sturdy steel case.

See your New Holland dealer. For the name of the dealer nearest you, call toll-free 800/447-4700. In Ill. 800/322-4400.

SPERRY NEW HOLLAND

Turn back for more reasons to buy New Holland. . .

You're a pretty important guy

...when you know Electronics. And now you can learn enough to break into this exciting field right at home in your spare time.

How would you like to be the kind of guy other men come to for advice and "know-how"?

The kind of guy businessmen and scientists lean on — and listen to?

With a salary that can bring a guy respect? And an impressive title like Technical Representative or Customer Engineer.

People admire a man like that. His success really shows. He doesn't have to be timid in business or social situations any more ... because he's important.

And you can be that man!

How? By breaking into one of the most exciting growth fields of the Seventies ... Electronics.

Today, whole industries are built upon Electronics. It's Electronics that makes computers and automated production lines and modern aerospace developments possible. And to keep all these electronic miracles running — to see that problems don't occur, and to solve them when they do — the world depends on a new breed of professional: the Electronics specialist.

The demand for people with technical skills is growing **twice as fast** as any other group, while jobs for the untrained are rapidly disappearing. There just aren't enough trained electronics specialists to go around.

With this kind of demand for qualified people, you can earn the kind of

salary you've always dreamed about. Once you have some experience, you can make \$12,000 a year or more ... but beyond tangible rewards, is the satisfaction of working in interesting and vital new fields.

You might think you need college to break into this great field. But you don't. You don't even have to leave home to go to technical school.

The Cleveland Institute of Electronics can teach you all you need to know, at home, in your spare time.

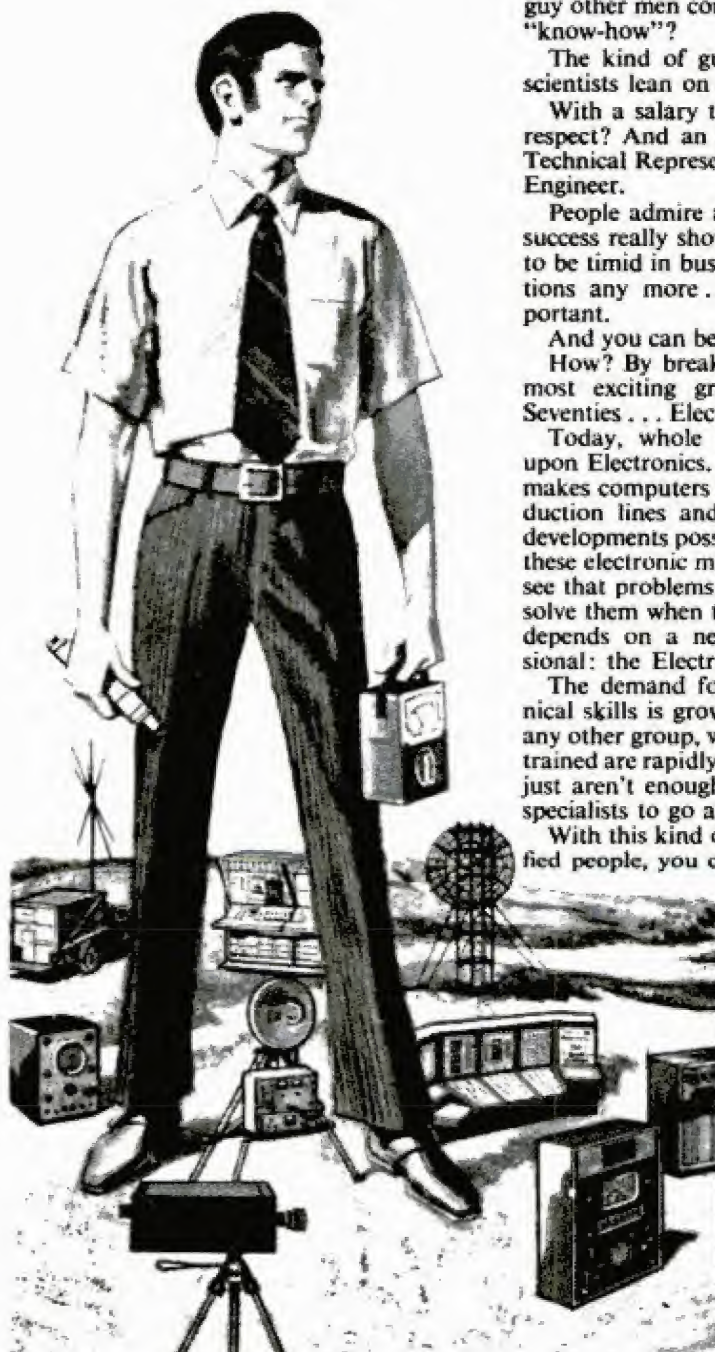
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PM-79

ALL OUTDOORS

By BILL McKEOWN

New items
for today's
sportsman

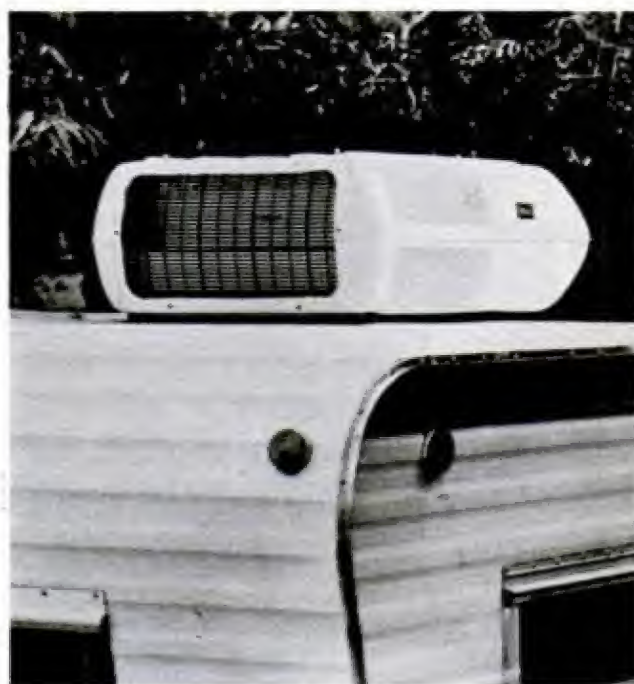


NOW Outboard Marine has dropped the other shoe. A year ago, after development work since 1966 on the Wankel-type rotary combustion engine, the big parent company of Evinrude and Johnson introduced an experimental 35-hp RC engine to test in its snowmobiles. Now it's an outboard motor with four of the units

stacked together into the world's most powerful outboard mill. Horsepower guesses go from 258 to 336; on-sale dates aren't expected until 1975. Next month we'll give you an inside look at this hottest of experimental outboard motors.



SCANMASTER, new DF-3 depth/fish finder from Shakespeare, is a completely portable lightweight unit that uses one 12-v. or two 6-v. lantern batteries



POLAR-AIRE, Coleman's evaporation air cooler, can operate eight hours or more from RV battery, drop inside temperature 30° during hot dry conditions

COLT TROOPER .357 Magnum revolver can become a rifle with \$50 16-inch barrel and \$35 gun-rest stock. Complete kit with pistol is \$275 from RMAC, Box 2219, Salt Lake City

(Please turn to page 24)

POPULAR MECHANICS

Can you spot the Camel Filters smoker?



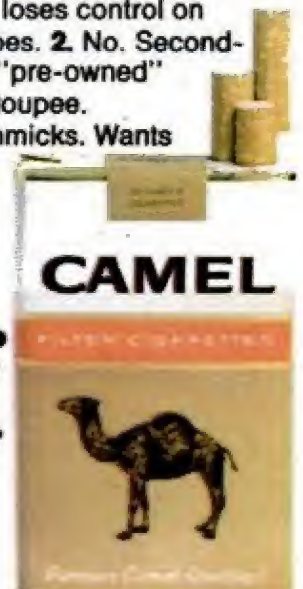
© 1973 R. J. Reynolds Tobacco Company, Winston-Salem, N. C.



Here at the Speedway everybody has a gimmick... almost everybody. Try picking the one who doesn't go along. **1.** Nope. He's "Third Turn" Abanian. Has been in 263 races. Gimmick: always loses control on

third turn where Bubbles Fickfern stands (see #5 below). He doesn't smoke. His car does. **2.** No. Second-Hand Sam Slick, used car dealer. Gimmick: buys what's left of Abanian's cars. Smokes "pre-owned" cigars. **3.** Hardly. He's Reggie J. Van Phynque II. Gimmick: filthy rich. Wears cashmere toupee. Smokes double-vented cigarette. **4.** Right. He likes his racing without far-out fads or gimmicks. Wants his cigarette that way, too. Camel Filters. Honest, no-nonsense. Fine tobacco. Easy and good tasting. **5.** Bubbles Fickfern, racing groupie. Gimmick: 18 stopwatches... with Mickey Mouse hands. Smokes Fellinis. **6.** Fellini. Gimmick: never sees a race; too busy following other sports events on portable TV and radio.

Camel Filters.
They're not for everybody
(but they could be for you).



Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

20 mg. "tar", 1.4 mg. nicotine av. per cigarette, FTC Report AUG. '72.

**ALL RIDING MOWERS
ARE EASY ON YOU.**



HOMELITE RIDING MOWERS ARE EASY ON YOUR LAWN.

It's too bad you can't test drive riding mowers before you buy one.

Because if you could, you might discover that while you're up there in the seat having a grand old time, your lawn is taking something of a beating.

HOMELITE DISCOVERS THAT THE LAWN ISN'T FLAT.

A lot of riding mowers have been designed as though the earth under them is flat. Their mower decks (where the cutting blade is) are fixed to the mower's chassis, which gives them absolutely no give. So when they run into a bump or incline, they really run into it. Turning grass into mincemeat.



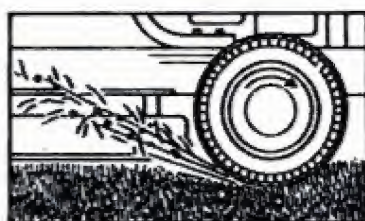
Homelite, on the other hand, attaches its mower deck to the front axle. When the wheels glide over a high spot, the deck



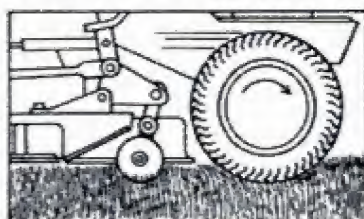
glides right along after them. Gently cutting your lawn instead of brutally scalping it.

HOMELITE LETS YOU SHIFT WITHOUT SHIFTING YOUR LAWN.

To shift gears on most riding mowers, you have to clutch. And while clutching may be just



great on the drag strip, it's a drag on your lawn. Clutch into reverse, for example, and you may find your back wheels spinning out — spinning out some grass in the bargain.



That's why Homelite's RE-8E (rear engine, 8 horse power) riding mower has a no-clutch transmission similar to the automatic transmission of a car. It enables you to shift smoothly from forward to reverse with a single lever. Leaving your lawn unscathed.

WE NOT ONLY PAMPER YOUR LAWN. WE GIVE IT AN EVEN CUT.

The cutting blades of our Homelite riding mowers are reinforced with rigid steel. And



when you have a 30-inch cutting swath, that can be very important.

Because the steel keeps the

blade from flexing on either end. Which means that every one of those 30 inches gets cut on the same level. And your lawn ends up looking even instead of odd.



WE DIDN'T FORGET ABOUT YOU.

Now that we've told you how good our riding mowers are for your lawn (and we've only had room to tell you part of it), it's time we paid some attention to you.

Electric starting is standard on our 7 and 8 hp. models (optional on 5 hp.). And they all have full plush seats that are actually adjustable. Practically effortless steering (the RE-8E even has a steering wheel instead of just a bar). And all kinds of safety features and operating conveniences.

But to get the full story on how easy Homelite riding mowers are on you, we suggest you go to your nearest Homelite dealer (to find him, call toll free: 800-243-6000, in Conn., 1-800-882-6500).

To get the full story on how easy they are on your lawn, we suggest you take one home.

HOMELITE RIDING MOWERS.

They're as easy on your lawn as they are on you.

ALL OUTDOORS

(Continued from page 20)



DAIWA 7000 heavy-duty, saltwater reel features a new skirted spool to prevent line from tangling in mechanism. Handle converts for left or right retrieve



BAREFOOT/GEAR insulated boots are claimed to be comfortable enough for wear without socks. In suede or smooth leather, \$58 by Nippon Rubber U.S.A.



ZEBCO Traveler Titan, left, unfolds to become a two-burner propane grill on top and a broiler below. **Trojan**, right, is ultralight, yet a full-size LP stove



CROSMAN'S newest is the Model 454 semiautomatic BB repeater pistol. Powered with a CO₂ cartridge, the well-balanced action shoots 16 BBs in rapid fire

NIGHTWIN LVP 250 from Lowrance is a 2-in-1 lantern with a spotlight or high-low fluorescent flood that can be recharged from 110-v. a.c. or even a 12-v. auto lighter



COLEMAN'S new single-burner propane stove is compact enough for a backpack but offers up to six hours of adjustable heat from large 16.4-ounce tank



There aren't very many fishing reels that can honestly be called "classics."

But this is one: the good old Zebco 33.

Our own R. D. Hull, the father of spin-casting reels, created it way back in 1953. And it's been America's most popular spin-casting reel ever since.

For all around use, you simply can't buy a better reel.

It's lightweight, only 8 oz. Well made (after all, we've had 20 years to perfect it). And it comes with over 100 yards (300 ft.) of 10 lb. test DuPont Stren® line.

You might say we build them to last, too.

Many of the original Zebco 33's are still catching fish today.

ZEBCO®

Reels and rods worthy of great fish.

Zebco Consumer Division Brunswick Corporation.
For a copy of our 4 color 1973 catalog, write Zebco, Box 270, Tulsa, Okla. 74101.

DETROIT

LISTENING POST

BY ROBERT LUND

DON'T MAKE ANY BETS you can't back out on that Gremlin will be the first American Motors car to get a rotary engine. It ain't necessarily so.

The Gremlin-gets-it-first story started as a result of a remark made by a company v.-p. When AMC's ready with a Wankel, the man said, it will probably be used in a car "at the low end of the line." As of now, that means Gremlin, because Gremlin's the bottom-priced car produced by AMC. But by the time the company's ready with a rotary, it will be rolling with a smaller-than-Gremlin car. And that's the job being tagged for the Wankel.

While you're hedging your bets, don't make book on American Motors putting a Wankel engine car on sale before 1975. And that's pushing it. In the past, other automakers, notably GM and Ford, have been generous in giving AMC a hand on technical and engineering problems—to the extent that's possible under the antitrust laws. But GM's not about to hand AMC any answers on the Wankel. "Nothing, that's what they'll get from us, unless they want to buy the information," a GM executive told PM. "No free ride."

The engineering guys at American Motors are in for a lot of into-the-night and weekend work.

GOODBYE, EFI. In an update for newsmen on what it will do to curb emissions on 1975-76

cars, GM flashed around drawings of the emission-control system it expects to use on vehicles of the mid-70s. The sketches showed an improved carb and choke. That's significant because it indicates GM will continue to produce its automobiles with a carb instead of going to electronic fuel injection.

That doesn't rule out the introduction of fuel injection on some GM products. But as of the moment, the carburetor is very much in GM's planning through 1976.

LATEST IDEA CAR from AMC, the Hornet GT, raises an interesting question. Do both sides of an automobile have to be identical? There's no law that says the left and right sides have to match up.

The Hornet GT is different from any car we've ever seen in metal in that the sides are not reversed twins. The most noticeable differences are that the driver's side uses more glass and has a narrower C pillar than the passenger side. The lack of symmetry, to quote American Motors, allows "product planners to evaluate variations in body design for possible use in future production models."

This idea isn't original with AMC. Designers have been doing cars with different side treatments in preliminary clay versions for years. But not in metal. That's the new angle on the Hornet GT. It's not a mock-up. It's a real car.

Think of the advantages of an asymmetrical car: Permanently sealed windows could be used

(Please turn to page 28)



AMC HORNET GT is styling exercise with left side different from right. Would you buy an asymmetrical car?



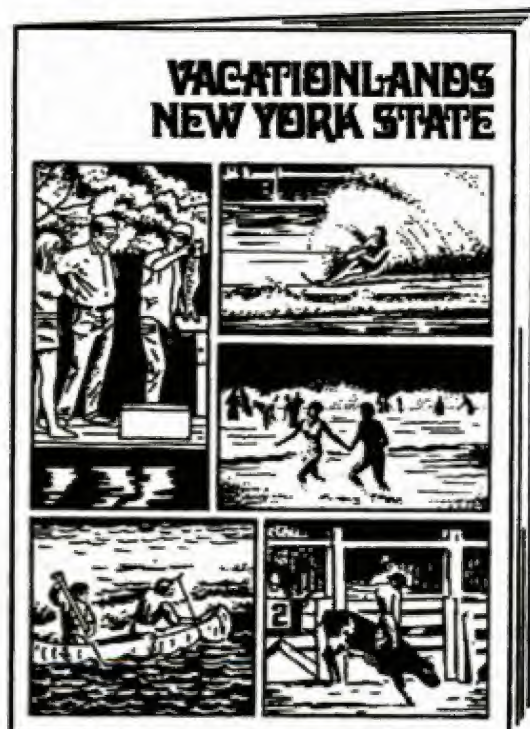
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DETROIT LISTENING POST

(Continued from page 26)

on the passenger side. Visibility would be improved, doing away with the blind spot over the driver's right shoulder. By staggering the C pillars, roofs could be strengthened to provide more crush protection in a rollover. (Something the car companies are going to be forced to do by government edict.) With sealed side glass on one side of the car, hollow inside doors could be used to conceal mechanical components, saving space now taken in the dash and thus making the concealed parts more accessible when they have to be serviced.

Will anything come of the asymmetrical concept? AMC's clever at coming up with ideas, but there have been lots of "idea" cars. Several years ago, when there was a lot of grumbling about the high cost of replacing sheet metal, Dick Teague, who designs AMC's cars, did an experimental job the exact opposite of Hornet GT. The car was called the Cavalier and sheet metal was interchangeable. The same doors could be used on the left or right side and hood and deck lid were interchangeable. Nothing ever came of that venture. Maybe the Hornet GT won't be kissed off as cavalierly.

FADE-OUT FOR PINTO, VEGA? There may be more than meets the eye in the \$225 dress-up packages—deluxe options—Chevrolet and Ford are offering for Vega and Pinto.

This is the same tack the auto companies took with the American compacts of 12 years ago, first offering more options and deluxe appointments, then making the options standard a year or two later and gradually transforming Corvair, Falcon, Valiant, et al, from small, low-price cars to bigger, more expensive cars.

Chev and Ford aren't abandoning the small-car market by a long shot. But they may be jockeying into position to upgrade their junior products to make room at the bottom for newer small cars.

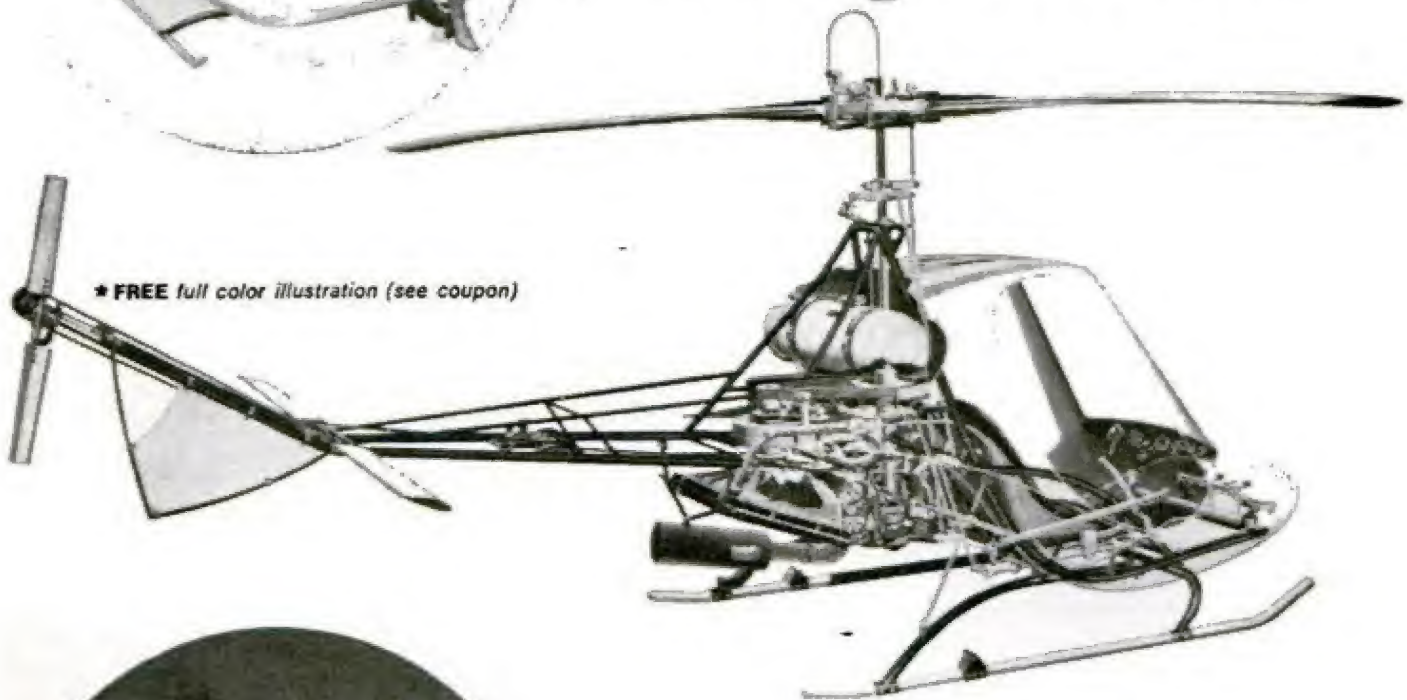
BETTER GAS GAUGES. Automakers are working on devices to provide more precise readings on how much gas you've got left. Fuel tanks have become, or will get, larger on all cars, to compensate for reduced mileage attributed to emission-control gear. Detroit thinks you should have a better gauge than a needle to tell you when you're running low on gas. New gauges are expected to include some sort of visual signal that'll flash red when the amount of fuel remaining in the tank gets down to three gallons.

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Superswift auto flash

New Braun recycles in 0.3 second—and automates bounce-flash exposure, too

By IVAN BERGER
Photography Editor

THERE'S A NEW BREED of automatic electronic flashgun coming—new units that not only measure out just enough light for flash photography, but ration out their power for the fastest possible recycling time as well. Braun's Vario Computer 2000 is the first of this new breed to reach the stores.

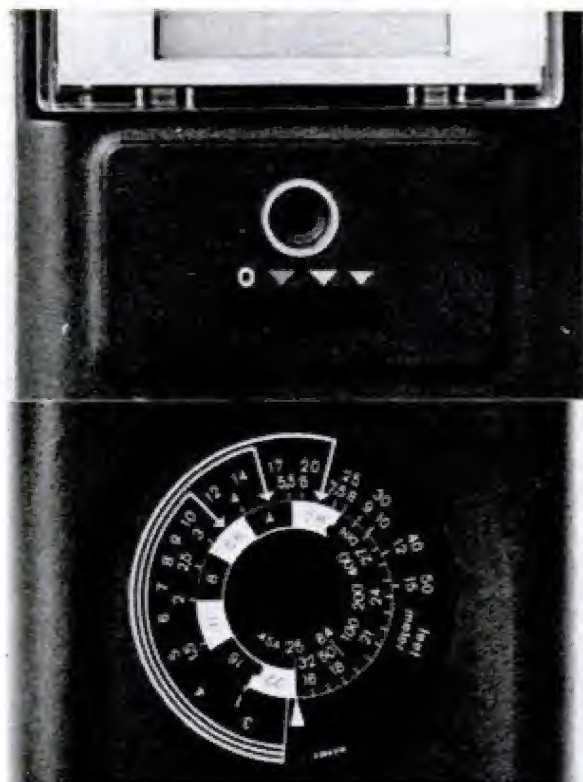
Exposure is the basic problem auto flashes solve. Since the light that hits the subject varies with the distance from the flash, conventional flashes and cameras make you readjust your f-stop for correct exposure each time your distance to the subject changes. But with auto flashes you don't have to change your f-stop to match the illumination on the subject—instead, the flashgun changes the illumination to match your f-stop. Move far off, where you need a lot of light, and the flash runs at full power. Move closer, and the flash cuts off as soon as its built-in electric eye senses that enough light has bounced back from the subject for correct exposure.

What happens to the rest of the flash charge? Earlier guns just dumped it into an internal flash tube; the gun drew off a full charge for every shot, whether it

(Please turn to page 32)



TILTING HEAD lets you shoot bounce flash, direct flash or any combination between. Light cell (circle below head) still points at subject, cuts off flash when exposure is sufficient



VARIABLE OUTPUT switch below the light cell (top) gives choice of three f-stops for automatic flash operation, or full output without auto cutoff (circle). Rear-panel calculator shows choices; here, for ASA 25, range is from 2½ to 11 feet at f/5.6, to 16 feet at f/4 and to 22 feet at f/2.8, with faster recycling at the wider f-stops. The manual guide number is 63

Chevy Pickups. The camper tamers.



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HANDY RECHARGER STAND takes eight hours or less per charge. A.c. flash needs accessory extension cord, recycles slowly



TWO IMPROVEMENTS I'd like to see: A ready light that's lower, closer to the eyepiece, and a flash cord that pulls loose less easily than this one does. But there's also a hot-shoe contact

SUPERSWIFT AUTO FLASH

(Continued from page 30)

used it all or not. New-breed guns, like the Braun 2000, just switch off the charge when light output is sufficient. Shoot from a distance, and the Braun still takes eight or nine seconds to recycle; but move in for a close-up, and the unit can blink back to full charge in as little as 0.3 second! And the number of flashes per battery charge goes up, too, from 60 or 70 shots at full output, to as many as 700 at shorter bursts. As with any auto flash, the Braun 2000 is great for action. At its fastest, it cuts off all the light in 1/20,000 second; at its slowest, it's still 1/600 or 1/700.

And the Braun has at least two more tricks up its sleeve. Its flash output can be varied to give you a choice of three f-stops with automatic operation—that makes it easier to balance exposure when you're using flash to fill in shadows on day-lit shots, and gives you some control of depth-of-field. But the other trick is even more useful: automatic bounce flash control.

Stick a flashgun on your camera

(Please turn to page 35)



CHOICE OF LIGHT EFFECTS includes: (clockwise from upper left) direct flash bounce off ceiling, bounce off side wall, and combination bounce and direct (with flash head at 45° angle). But bouncing means longer recycling, fewer shots per charge

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BOUNCE FLASH (right) illuminates room more evenly than direct flash (left), gives softer, more natural look when used to fill shadows on backlit shot. Choice of f-stops also simplifies flash fill-in

SUPERSWIFT AUTO FLASH

(Continued from page 32)

and fire it, and your picture will be either harshly shadowed or so flatly lit you lose facial details. Point the flashgun up and bounce it off the ceiling, and you get much softer, more flattering results. But bounce flash complicates exposure: Instead of basing your f-stop calculation on the distance from your camera (and flash) directly to your subject, you must estimate the total distance from the flash to the ceiling and from there to the subject, then estimate how much to correct for light lost and scattered when it hits the ceiling. Most amateurs don't use bounce flash, precisely because it is so complicated. And until recently, you couldn't use an auto flash for bounce, either—when you tilted the flash back, the light-sensor would read only the light that hit the ceiling. But the Braun (and a few other flashers) have flashtubes that swivel independently while the light cell faces the subject: You can shoot direct flash, bounce, or a combination that gives you softness and sparkle.

Braun's Vario Computer 2000 comes in two models: The \$119.95 F 022, has a guide number of 52 for ASA 25 film, weighs 12 ounces and gets a minimum of 50 flashes per charge (charging time for the built-in batteries is about eight hours); the \$139.95 F 027, with GN 63 for ASA 25, gets 60 or more flashes per charge and weighs 17 ounces.

For further information, write Braun North America, 55 Cambridge Parkway, Cambridge Mass. 02142 ★★★

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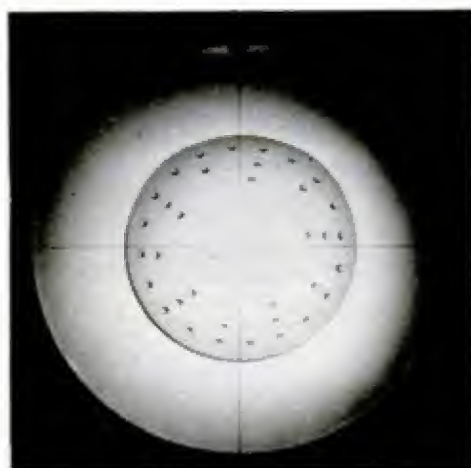
science worldwide

By JOHN
PEARSON



Boots aid circulation in legs

A DANGER IN SURGERY is the formation of a blood-clot in a patient's legs. It can "break off" and lodge in his lungs, causing death. Clots result from poor circulation in the legs, a condition that may call for massage during an operation. A better way, according to Dr. Colin Roberts of King's College Hospital, London, is to use his pressure boots. The plastic boots, put on before the operation, fully enclose the lower leg. When pressurized with air, they force blood out of the legs and into the patient's trunk, enhancing circulation. Without the boot, 30 out of 100 patients may develop clots, according to Dr. Roberts. His invention reportedly reduces the rate to 6 out of 100.



Lens after exposure to laser

TWENTY-FOUR PREVIOUSLY UNKNOWN SEAMOUNTS—underwater mountains—have been discovered by researchers in the National Oceanic and Atmospheric Administration. All of the seamounts rise over 3000 feet above the floor of the Pacific, and at least four tower about a mile high. Their discovery came during analysis of data gathered during a five-month survey that had been conducted off the coasts of Washington and Oregon.

COMPUTER-OPERATED LASERS are now used to burn tiny holes in plastic contact lenses to allow air to stimulate the circulation of eye fluids. Lenses without holes may cause eye irritation. Mechanical drilling of holes is time-consuming, expensive and requires that the lens be repolished. According to scientists at Lombart Lenses, Ltd., Norfolk, Va., the laser burns as many as 30 holes in a few seconds. By generating temperatures of 9600° F., the laser vaporizes the plastic, leaving smooth holes requiring no repolishing.



Chow time for birds under wraps

WHAT'S THE BEST WAY of keeping warmth-loving Brazilian hummingbirds from catching cold in an aviary that's apt to be on the chilly side in winter? Wildlife expert Leonard Hill, who cares for 1200 different types of birds in Gloucestershire, England, wraps the delicate hummingbirds in cotton and keeps them snug in tiny compartments. Since they can't fly in search of nourishment, they must be fed by means of a feeding tube also designed by Mr. Hill.

SPACECRAFT PIONEER 10 has come through the Asteroid Belt unscathed and now has completed about 70 percent of its 620-million-mile flight to planet Jupiter, according to NASA officials. As a result, scientists now believe that the Belt may contain less solid material—especially in the smaller particle sizes—than

(Please turn to page 38)

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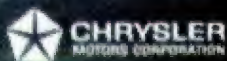
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SCIENCE WORLDWIDE

(Continued from page 36)

previously believed. Asteroids are small bodies, most of them less than a mile in diameter, that tend to travel in a doughnut-shaped region between the orbits of Mars and Jupiter. Launched in March, 1972, unmanned Pioneer 10 is scheduled to arrive at Jupiter next December.

The environment

WHEN SMOG REACHES dangerous levels in Recklinghausen, police uncover signs forbidding cars from entering certain areas during four hours in the morning and six in the evening. The town lies in the Ruhr Valley, the heaviest industrialized region of



West Germany, and suffers serious problems of air pollution. When there's no wind to blow away pollutants, the smog signs appear—and the motorists come into town on foot.

OIL GLOBULES and plastic debris in massive proportions infect nearly 700,000 square miles of ocean from Cape Cod to the Caribbean Sea, according to findings made during three cruises by research ships operated by the National Oceanic and Atmospheric Administration. One ship reported that its specimen-collecting nets were befouled by congealed oil that hung through the mesh "like spaghetti." ★ ★ ★



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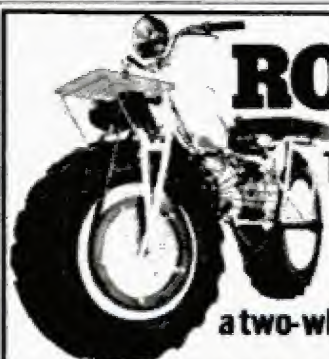
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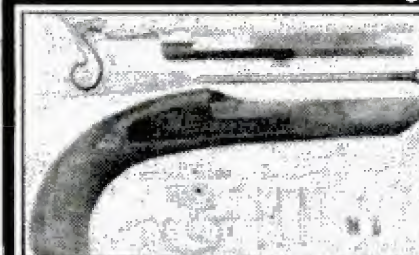
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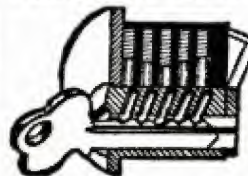
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APPLIANCE CLINIC

By PAUL MANN

Spent spinner

We have a Maytag automatic washer that has worked perfectly since 1965, except that the spin dry goes out-of-balance even when the machine is handling a light load. This causes the washer to shut off. The machine seems to be leveled okay, so what else could be the trouble?—A. J. Blalock, Roach, Mo.

Three centering springs (in the damper assembly) hold the tub in balance. If the springs are out of adjustment, the machine will lose level and shut off. I suggest you adjust the springs by first making sure the washer is level and leveling legs are locked in place. Add a normal load of clothes and fill the washer. Allow it to agitate—then shut it off.

Adjust the centering springs by tightening the center spring screws at the base of the brackets to which springs are connected. Adjust springs so the tub leans very slightly to the rear. This machine is equipped with an unbalance switch in the rear. If the tub is leaning forward, the washer will shut down prematurely.

Excessive energy

I have a Tappan upper-lower double-oven range. At times, the lower broiler comes on full blast although the control is at "off." I then have to cut off the gas supply to the broiler to shut the unit off. The Tappan service people have replaced the thermostat twice, the solenoid system three times and the entire electrical system once. The range has had this problem since I bought it. What gives?—Rita Levreault, Easthampton, Mass.

After all that's been done to the range, I doubt if the problem exists there. What, then, is causing the electrically operated safety valve to open, allowing gas to be prematurely ignited? There's a chance that the wall outlet isn't wired properly. The trouble will occur if the electrician who installed the outlet had accidentally reversed the black and white leads (white is the common, or ground, lead). In other

words, the outlet may not be grounded properly, which means that the range isn't grounded properly. You should have a serviceman check the outlet with a voltmeter.

Erratic ignition

Our Hamilton gas dryer has developed erratic ignition. At times the pilot and main burner won't ignite although the glow coil is lit. How come?—L. Turco, New Kensington, Pa.

One of three conditions probably exists. In the order of likelihood, they are:

1. **High resistance.** The glow coil may not be glowing bright enough to provide instant ignition because of a buildup of resistance. You may be able to avoid replacing the coil by shortening a resistor wire.

Take off the top of the dryer and find a solid-core resistor wire which is protected by rubber insulation leading from the glow coil to the transformer. Remove the spade clip holding the wire from the transformer and clip off about two inches of the wire. Buy a new spade clip (available at auto supply parts dealers) and crimp it on.

Do not cut the other wire you will see, which is protected by asbestos insulation. Shortening the resistor wire lessens the resistance at the glow coil, which will permit the coil to glow more brightly.

2. **A dirty pilot.** This condition is verified by the presence of a soft, floating flame that may be tinged with yellow. Cleaning a dirty pilot is not usually a job for homeowners. Call the service department of your local gas company.

3. **Lack of deflection.** There should be a metal plate over the pilot to deflect gas to the glow coil. If a serviceman ever replaced or worked on the pilot, he may not have repositioned this plate.

Flame-out revisited

Last December's Appliance Clinic discussed a problem entitled "Flame-out" concerning a Lady Kenmore 800 gas dryer that would ignite properly, but would run only for a few minutes before the flame would die out. The owner had replaced the glow coil, and we suggested that the hydraulic safety switch be checked. Since then, several readers have written to relate their experiences.

John Luciene, for example, reports he

(Please turn to page 50)

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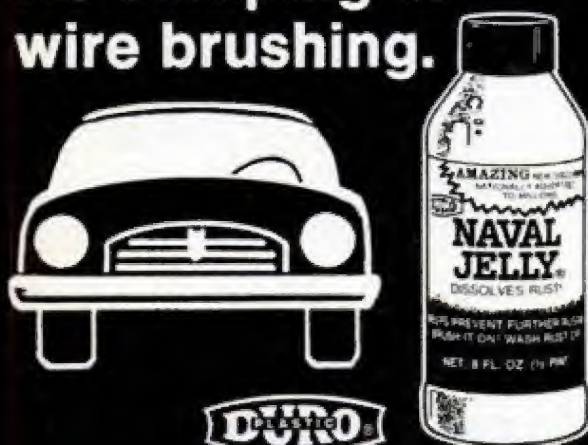
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angina, ear noises and dizziness. How it helps fatty yellow lumps in the eyelids, indigestion, acid stomach, and colitis. Includes the Fresh Food Diet showing which foods to buy in your grocery store and which to avoid. Pictures and drawings. Effects of better diet on face and figure. Quick easy ways to cook well and reduce kitchen work.

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"I did it with one 5-minute exercise, twice daily, lying on my back—WITHOUT DIETING!"

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BEFORE






RESULTS NOTARIZED

AFTER 21 DAYS



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I hereby attest to having my waist measured at 44 inches and my weight at 241 on August 7. I didn't diet, but ate sensibly. I just did a 5-minute exercise on my back two times a day and the flab seemed to melt off! Now, I look better, feel great and have a lot more confidence in myself! It's like getting a new chance at life!" Michael Benedict

ROBERT W. ALESQUIRE
NOTARY PUBLIC — CALIFORNIA
JANUARY 1969
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Aug. 7th.
Weight 241
Waist 44"

"At 54 I thought I was too old to do anything about my physique. I was wrong! With Joe Weider's '5-Minute Body Shaper' Plan, I lost 22 pounds of old fat and 6 inches from my waistline in only 21 days! I couldn't believe it, but the scale and tape measure don't lie! I didn't diet, but ate sensibly. I just did a 5-minute exercise on my back two times a day and the flab seemed to melt off! Now, I look better, feel great and have a lot more confidence in myself! It's like getting a new chance at life!" Michael Benedict

Aug. 28th
Weight 219 (lost 22 lbs.)
Waist 38" (lost 6 inches)

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APPLIANCE CLINIC

(Continued from page 46)

placed the hydraulic safety switch without success. Then, he relates, "by sheer chance I changed the drive belt which connects the motor to the ventilation fan and found that this corrected the problem. It seems that if the fan is not drawing air properly, it causes the safety switch to kick on."

According to Robert Osborne, "We corrected a similar problem by cleaning out the lint which had blocked the air exhaust pipe."

Erwin Lawson had the same trouble with his Kenmore dryer. He cured it by cleaning the slots from which the pilot flame emerges.

Tim McCarthy also contends that dirt causes the trouble. He suggests that lint around the fan or blocking a vent must be cleaned anyway. He states further that the motor may be overloading and kicking off because of lint in the end vents. He recommends a "good cleaning."

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. However, problems of widest interest will be answered in this column.

Service tips

● Try several dishwasher detergents, suggest dishwasher manufacturers, to find the brand that gives you the best wash. Results vary because water conditions vary. Never use laundry detergent or ordinary soap. Store dishwasher detergent in a cool, dry place and keep the box cover closed.

● Maintain your garbage disposer at peak efficiency by following this routine: Flush the trap at the end of each day's use. Run cold water into the sink about 3 to 4 inches deep. Do not turn on the unit but remove the top and allow water to drain rapidly. This large volume of fast-moving water helps get rid of eggshells, coffee grounds and pulpy material that may be caught in the trap.

● To protect your washing machine, try these simple, after-washing tips: Turn off both hot and cold-water faucets to relieve the pressure on both hoses; wipe off bleach, detergent and solvents that have been spilled on the outside of the machine with a clean, damp cloth; wipe out the inside of the tub and agitator; leave the loading door open so the interior will dry. ★ ★ ★

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SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

Choke check

My 1971 Mustang with 302-cu.-in. engine stalls when first shifted into DRIVE or REVERSE on warm days only, and it also idles rough. Yet on cool days the engine performs beautifully. A tune-up hasn't solved anything. What will?—Edward Stefanik, Fall River, Mass.

The engine is probably loading up with fuel, creating an overly rich condition for a warm day. Check the functioning of the automatic choke to include examination for a dirty linkage that is causing the choke plate to bind. Also see to it that the choke cap index and choke pull-down settings are checked for warm weather operation.

These settings may have to be readjusted to provide a leaner fuel mixture.

Let the sun shine in

The dark blue dashboard of my 1967 Plymouth Fury has lost its "flatness" and reflects glare into my eyes when the sun or headlights shine on it. Is there some way of darkening the blue-black vinyl once again to reduce glare?—M. Donald McGavin, Manhattan, Kans.

Visit a dealer of automotive paint supplies and buy an interior acrylic lacquer paint and a flattening agent. Add the flattening agent, which absorbs light, to the paint in a 1:3 proportion—for example, ¼ pint of flattening agent to ¾ pint of paint. Mix well and pour into a pre-valve sprayer, which you can also buy from the auto-paint dealer. The sprayer is a bottle equipped with a spray jet. Spray the paint on evenly.

Boiling battery

The platform on which the battery of my 1969 Volkswagen Squareback sits keeps forming corrosion. Is there a way of stopping it or must I face the constant chore of cleaning?—Christopher Kirchberg, Salem, Mass.

Electrolyte in the battery probably is being "boiled" by an overcharging voltage regulator so that this acid can escape

through the holes in the vent caps over the cells and run down the side of the case to the platform.

You should have your voltage regulator tested. If it is allowing the generator to put out more than 14.5 volts, have the unit readjusted or replaced.

Old-fashioned reception

My 1971 Cadillac has a stereo radio. The antenna is in the windshield. The nearest stereo broadcasting is from Tulsa, which is 45 miles away, and reception is mushy. How can it be improved?—H. L. Lynch, Bartlesville, Okla.

Install an "old-fashioned" fender antenna.

Squashing surge

Here's a tip that may help your readers: I had a problem of surging with my 1968 Chevrolet. The car was checked from stem to stern with diagnostic equipment, and everything proved to be in good order. As a last resort, a mechanic checked the emission-control equipment and found that the PCV valve was partially clogged. He replaced the valve, and cleaned out hoses and passages. The surge has vanished.—Larry Grover, Scranton, Pa.

The PCV system, especially the valve, can be the cause of various engine complaints, particularly stalling on starts and poor idling. Your tip should be a valuable one for many car owners.

Smoking is dangerous to your health

This problem concerns two 1967 Fords, both with 289-cu.-in. engines. There is a great amount of oil smoke pouring from the oil filler caps. The PCV system has been cleaned and the PCV valve has been replaced. Incidentally, the valve gets a whitish oily substance on it. Engine compression is okay, and little oil is consumed. Any thoughts?—John R. Buehile, Quakertown, Pa.

Yes—condensation in the oil. Although you may change oil religiously, it can still

(Please turn to page 56)

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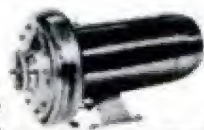
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AUTOMOBILE CLINIC

(Continued from page 52)

be getting contaminated by condensation that has been absorbed by sludge trapped beneath the valve covers. This would account for not only the fumes, but also for the whitish substance that fouls the PCV valve. Remove the valve covers and clean them thoroughly. Clean sludge off the heads, too. Change oil and oil filter, run the car for about 1000 miles and change oil again. The smoking should stop. If it doesn't, take another hard look at compression.

Inside tire story

My problem is excessive front-tire wear on a 1966 Chevrolet Biscayne. The tires are wearing abnormally on the inside. I have had front wheels balanced, front end aligned and new ball joints installed. Sometimes I get a play in the steering wheel, like a shimmy, at low speeds. What now?—Frank Catalanotto, Deer Park, N.Y.

Are you sure that tire wear isn't a carry-over from previous front-end misalignment? Unless the front tires were ro-

tated or new front tires installed after the front end was aligned, you may still be seeing the effects of a previous misalignment problem.

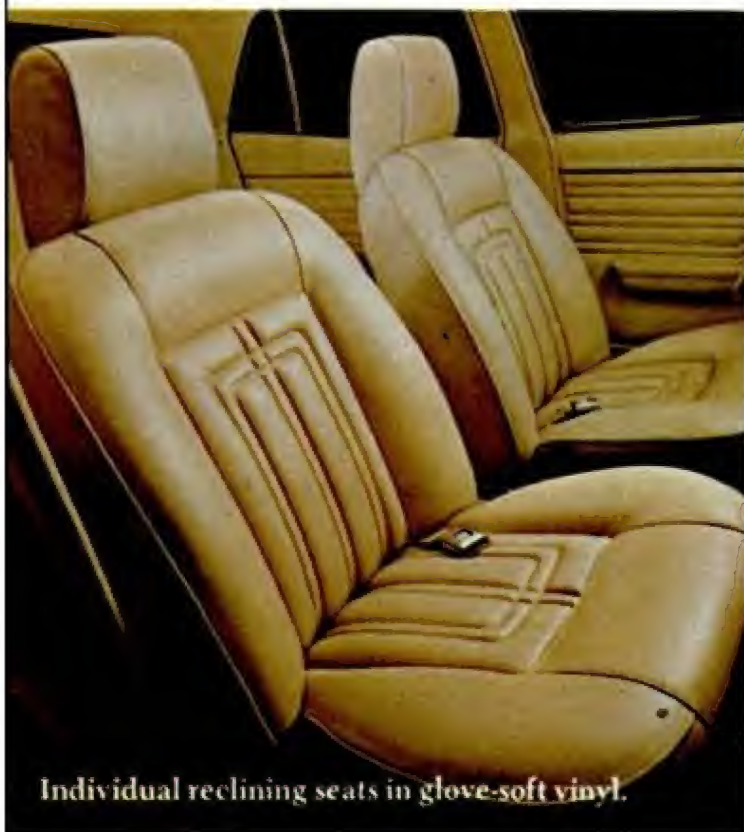
Assuming you have new front tires, though, and the front end has been aligned properly to specification, the problem you're experiencing with tires could also be causing the play in steering. The trouble may be worn or loose front wheel bearings, worn or loose tie-rod ends, worn or loose steering idler arm, and worn or loose steering relay rod. Another possible cause to be checked for setting to specification is the steering-gear worm bearing and lash adjustment.

Turning off a blowhard

Is there a way of stopping the ventilating fan from blowing constantly in a 1972 Buick? I drive mostly in heavy city traffic, and the fan sucks exhaust fumes from buses and trucks into my car, making me feel sick. Others I talk to have the same trouble. Can you help?—Anthony Grigas, Chicago.

Take the car to a Buick dealer and have him apply the procedure that's outlined in

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Service bulletin 71-I-109A. Cars with heaters only and with automatic airconditioners have to have a microswitch installed and the blower circuit modified. Cars with manual airconditioners have to have the blower circuit modified. The outcome will be the end of automatic blower action. Accordingly, the blower will operate only when you turn it on.

Service tips

● Oldsmobile is trying to resolve the question of whether to use Dexron automatic-transmission fluid in power-steering systems instead of power-steering fluid. The company states that power-steering fluid should be used whenever possible, because it provides the "best overall performance," helping to prevent pump squeal and providing the best lubrication of the pump. However, there is no danger in using Dexron automatic-transmission fluid to bring the power-steering fluid up to level if power-steering fluid isn't available, but there is a condition. When over half the

fluid in the system has to be replaced, power-steering fluid only should be used.

● Chrysler Corp. advises that if a no-start condition occurs in any of its 1973 passenger cars or light trucks, and there is no spark at the sparkplugs, you should suspect that the electric-choke assist has shorted. If a short develops in any part of the system, the electronic ignition system will be disrupted. Three likely reasons for a short are contact between the cylinder head cover clip and choke connector of 360 and 400-cu.-in. engines, contact between a bare wire and the engine assembly, and an internally shorted choke assembly heater.

● All car owners, for years, have looked for a way of cleaning tough-to-remove stains from interior glass surfaces. These stains result from tobacco smoke, dust, and film caused by ingredients used in vinyl, plastic and other interior trim materials. General Motors advises that its glass cleaner (part No. 1050427) gets rid of stains. Try it—you should like it. Get it from a GM dealer. ★ ★ ★

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THE BICYCLE SHOP

By EUGENE A. SLOANE

This month Gene catches up on some of the many cards and letters from readers and answers their questions about bike repairs, tools and touring

Q. Caliper brakes don't work in the rain—and not even well enough to stop a bicycle safely under any conditions, according to a newspaper story I read. I'd appreciate your comments.—*J. Repp, Dearborn, Mich.*

A. Caliper brakes do work in the rain. I've ridden in the rain many, many times and I've never had trouble stopping safely under any and all conditions. It's all a matter of brake adjustment. If brake shoes are old and hard, if brakes are not properly adjusted, if cables are slack so you can't exert full pressure on the brakes, if wheels are way out of round, then of course caliper brakes won't work properly.

Q. When I put the rear sprocket gear lever on my new 10-speed bicycle into first gear, the chain will not shift to the large sprocket. This occurs whether the front chainwheel is in high or low gear.—*Charles Fortune, Pennington, N.J.*

A. Sounds to me as though the cable has stretched beyond the point where it will pull the derailleur over to the large rear gear. I assume by "first" gear, you mean the smallest of the five rear gears. Check for cable slack by putting the gearshift lever into the small rear gear position; if there is any slack, loosen the derailleur cable nut retaining screw, pull excess cable through with small pliers and retighten the cable locknut on the derailleur.

Q. I recently bought a 20-inch Stingray high-rise bicycle and find it's awfully hard to pedal. It's also too short and my knees hit the handlebars. How can I make it taller and easier to pedal?—*Andy Swadener, Mishawaka, Ind.*

A. I'm sorry to tell you that the bicycle you describe is inherently hard to pedal because it is very heavy and not designed for effi-



AN ALL-PLASTIC BIKE—except for the wheel structure. That's what the developers of the Original Plastic Bike plan to have when they put their new 10-speed on the market this year. Virtually every part of the prototype (top photo, above) was plastic at the time of its first public display. The plastic parts included frame, handlebars, fork, front and rear hubs (lower photo, above), freewheel and double chainwheel. Even the chain, derailleur and caliper handbrakes will be plastic in the production model. The plastic used is Lexan, a high-strength, lightweight polycarbonate material developed by General Electric. Color is molded into it, so the bike never needs paint, and the total weight is about 16 pounds—light enough for it to float. Price of the 10-speed will be under \$100, and the Original Plastic Bike Co. plans to have five-speed, three-speed and 26-inch folding models. No bicycles were available for testing at the time of this writing

ciency, but rather to appeal to young people. About the only way you can make it easier to pedal is to trade it in for a conventional 26 or 27-inch 5 or 10-speed.

Q. I took your book, *The Complete Book of Bicycling*, with me to a bike shop so I could test a bike before buying it. I put the book on the floor and started checking the bike, and the

(Please turn to page 61)

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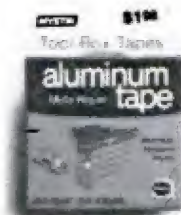


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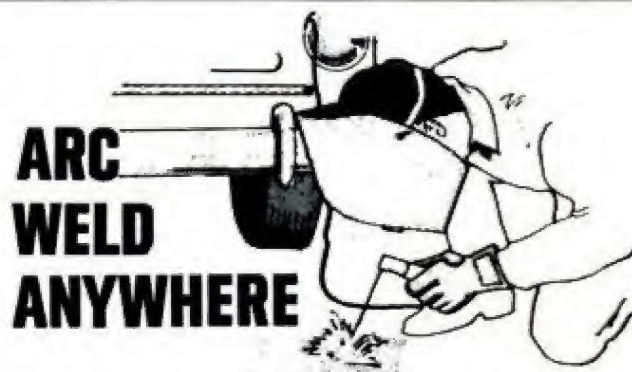


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THE BICYCLE SHOP

(Continued from page 58)

owner suggested I leave. Do you think the bike was bad?—Harold Thrasher, Fort Smith, Ark.

A. Bike dealers generally don't like kids messing around with the new bicycles. It's understandable because bikes are displayed in rows, and if you knock one over, you'll get a chain reaction that knocks over maybe 10 or 12. I'm sure you're not the type of young man who knocks over bicycles, but the dealer doesn't know that. A good dealer welcomes intelligent questions from customers.

Q. Do you recommend removing the same rivet from a chain? And who makes Lubriplate products?—Gregory Dolansky, Los Fresnos, Tex.

A. It's too much trouble to keep trying to find the same rivet to remove; anyhow, it doesn't make much difference. And Lubriplate is made by Fisk Brothers Refining Co., 129 Lockwood St., Newark, N.J. 07105.

Q. Where can I get a heavier tread tire for a 10-speed bike? Many roads here are rough and unpaved, and I've also had trouble with thorns.—Don Hainsworth, Shelley, Idaho.

A. You probably don't need a heavier tread tire. What you probably need is to keep tires properly inflated, say around 60 or 70 pounds. If you have trouble with thorns, you need special, heavier, thorn-resistant tubes. Your dealer should carry them; if you're having trouble, so is everyone else in your area.

Q. My son has a five-speed without a front derailleur, just a single chainwheel. The chain keeps coming off the chainwheel when he is pedaling and/or when he is shifting. It has never come off the derailleur. How would you solve the problem?—W. K. Millholland, Gaithersburg, Md.

A. The chainwheel is very likely way out of line. Find the part that's out of alignment and with a large monkey wrench, bend it gently back to true. The chain may also be too long. When the chain is on the middle of the five rear gears, the jockey and idler wheel of the derailleur should be vertical to the ground. If not, the chain is too long or too short, and you should add links or remove them accordingly.

Q. I've done all my cycling so far on a trusty old three-speed. I'd like to get a new 10-speed, but I wonder how rugged they are and how much maintenance they need.—David R. Krieger, Long Island City, N.Y.

A. The trusty new 10-speeds are a lot more

rugged than the heavier three-speeds. The good 10-speeds, costing upwards of \$250, are made of seamless drawn chrome molybdenum or other high-strength alloy steels, whereas the old three-speeds are frequently made of seamed tubing about a shade better than gas pipe. The 10-speeds are a lot easier to maintain, with the transmission system simpler and out in the open for maintenance. I'd vote for a 10-speed any old day.

Q. My new 10-speed Schwinn Continental came with Gumwall tires. What are the advantages of this tire? Are there any disadvantages?—James Sdao, Quakertown, Pa.

A. They are a bit more responsive than all-black tires and more expensive. They are also, in my opinion, stronger. I see no disadvantages compared to other types of 27x 1¼-inch tires.

Q. In my native New Zealand, I was able to buy telescopic forks for my bike. I cannot find them here and would appreciate knowing where they may be obtained for my three-speed bicycle.—Ivan Rowe, Fresno, Calif.

A. Telescopic forks have long since been phased out of the U.S. bicycle industry, so I'm afraid I can't help you. Sorry.

Q. Where can I get information about Raleigh, Murray and Triumph bicycles?—Steve Conner, Glenvil, Nebr.

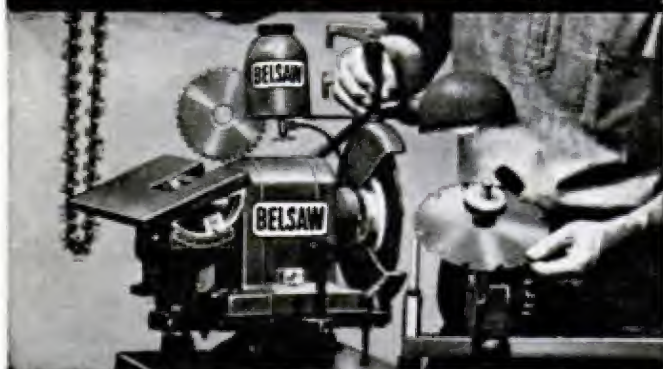
A. Your best bet may be to write to one of the bicycle mail-order houses, such as Wheel Goods Corp., 2737 Hennepin Ave., Minneapolis, Minn., and send \$2 for the bike catalog.

Q. I'm wondering about changing my Huffy Sportsman three-speed "English" bike to a five-speed with derailleur shift gears. Where can I get the shifting mechanism, the gearshift levers and a new rim with sprockets at a minimum cost?—Paul Flagg, Belfast, Me.

A. Any dealer can sell you an inexpensive Normandy hub, five-speed gear cluster, derailleur 3/32-inch chain and gearshift lever, together with new spokes, for about \$20. If the dealer has to do the installation, add another \$10 or \$15. I question whether the changeover is worth it. You would have to grind the front chainwheel to the 3/32-inch diameter, which can be done by removing the chainwheel from the bike and applying it to a grinding wheel. However, this is not going to be terribly satisfactory because you

(Please turn to page 62)

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THE BICYCLE SHOP

(Continued from page 61)

can't get a precision grinding job unless you're a skilled machinist. You might try to find a junk bicycle with a 26-inch rear wheel and old gear cluster already assembled and take a crack at grinding down the chainwheel and buying a new chain.

Q. Where can I buy a Cinelli in the Chicago area?—Mark Burda, Homewood, Ill.

A. A major Cinelli importer in that area is Oscar Wastyn Jr. Cycles, 2221 North Milwaukee Ave., Chicago, Ill. 60647.

Q. I recently acquired a Schwinn Varsity and in remounting a tire, I could not get the bead to mount correctly. In one or two places the bead slipped to the center of the rim. Is there any easy way to mount the tire? And how many miles should I expect per tire?—Richard Angus, Assonet, Mass.

A. The Schwinn rims should take only Schwinn tires. That could be your problem. (Mounting a tire would take a separate article; I'll get into that, in the future.) As for miles per tire, that's a function of how well you avoid curbs, gutters, glass and the like and whether you keep correct pressure (about 60 pounds) in your tire. You might get five miles—or 3000 or 4000 miles, depending on luck and care.

Q. I am a young cyclist and I want a better bike. Is it a good idea to buy some used bikes and fix them and sell them—and then buy a new bike with the money?—Chris Gatz, Low, Ky.

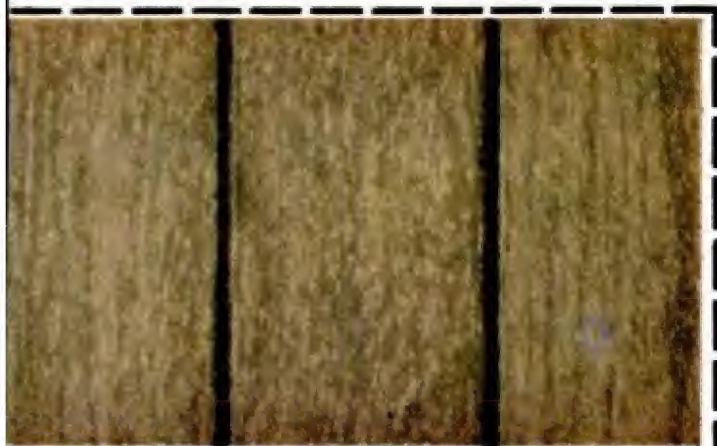
A. It sounds like an excellent idea to me, and I congratulate you on your business enterprise.

Q. Where can I find a bicycle freewheel remover for a Shimano freewheel, as shown in your April '72 Bicycle Shop?—Karl Drebohl, Kalamazoo, Mich.

A. Your local bicycle dealer can obtain one through his bicycle wholesaler, who can get it from Shimano American Corp., 1133 Avenue of the Americas, New York, N.Y. 10036.

Note to readers: This is not a question or an answer, but a plea to readers. Please do not send me money for books or catalogs. I only have to return it because I do not have books, catalogs or tools for direct sale. Please order such items from publishers or from manufacturers.—E.A.S.

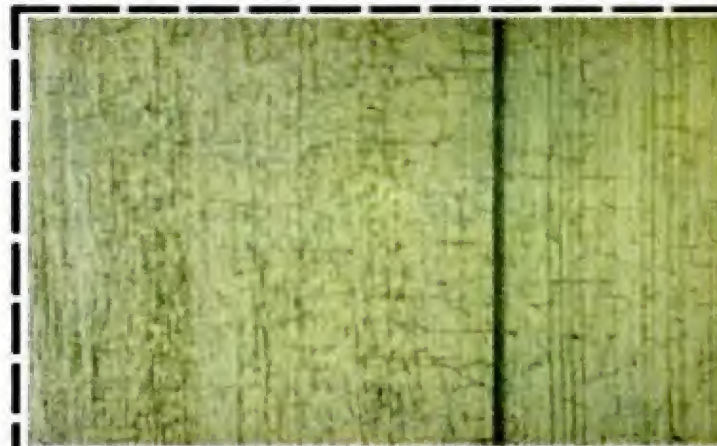
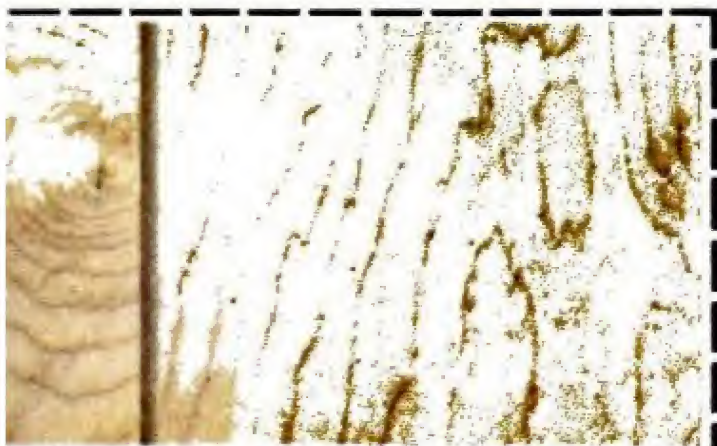
**"If pictures of fancy rooms
never seem to help you choose a panel,
have a talk with the Paneling People."**



Wally Bruner, host of the do-it-yourself TV show "Wally's Workshop", passes along a few tips on how to choose a panel.

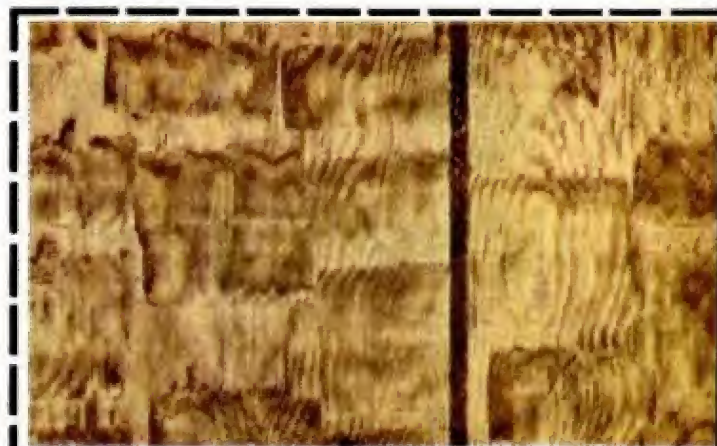
Tone. "In general, lighter panels are contemporary, while darker ones are more traditional. So, if you like Spanish, or Early American, shop the dark or medium-toned panels, like Early Spring" Bruin, above.

"If you like contemporary or provincial, browse through the light panels, like Woodglen" Natural Birch, below."



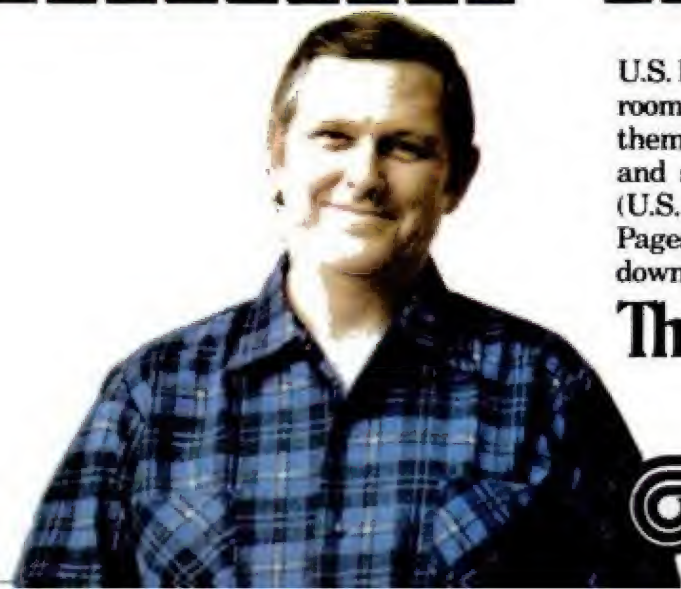
Color. "Pick a color you know you can live with, and you'll be surprised at its versatility. Gaslight" Moss, for instance, above, would look well with delicate shades of blue/gold, bittersweet/green/ivory or navy/white combinations."

Texture. "U.S. Plywood makes some textured panels that are beauties, like Shenandoah", below. Texture holds special appeal if you're fond of drama, or want to make one room particularly bold. This is Buckskin Brown, just one of our eight outstanding Shenandoah colors."



Finally, from the more than 130 panels that U.S. Plywood makes, choose one you can 'see' in your room. Try cutting these swatches out and comparing them on your walls. Then visit the Paneling People and see the actual colors and complete selection. (U.S. Plywood/Weldwood dealers are in the Yellow Pages under Plywood.) And remember, you'll get down-to-earth help from

The Paneling People.



U.S. Plywood

A Division of Champion International

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YOUR IGNITION CONTACT POINTS could well be called the heart of your car, for your engine's running depends on the steady, positive pulse of those contacts—100 million beats per year in the average eight-cylinder car.

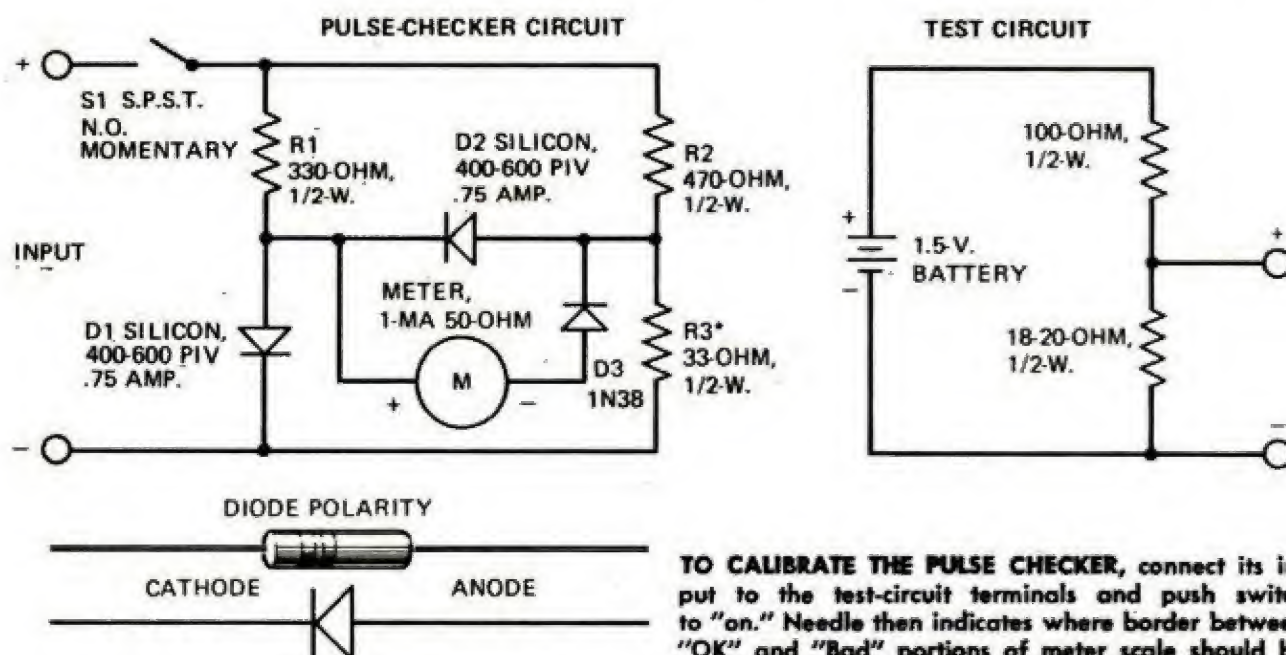
Points are traditionally replaced at regular intervals of 10,000 to 12,000 miles. But this does little good if the points should go at 8000 miles, and is a waste of money when points are replaced that might still have another 10,000 miles of life left in them.

The trick is knowing just when points need replacing. You can tell by a visual, underhood inspection, or by checking the contacts under actual running conditions.

Auto diagnostic centers perform such dynamic tests, but you can, too, with this simple, pushbutton Pulse Checker.

Circuit construction is straightforward and not too expensive (about \$8 to \$20 if you buy new parts just for this project; less if you buy in quantity or have some parts on hand). Make sure you install the diodes in their proper places and with correct polarity (see diagram). The only unusual step is adding an "OK-Bad" scale to the meter dial. Most meters allow easy disassembly and scale replacement; be careful that you don't accidentally bend the pointer. If you just mark the first tenth of the meter scale "OK," you'll be pretty close; but for a more accurate loca-

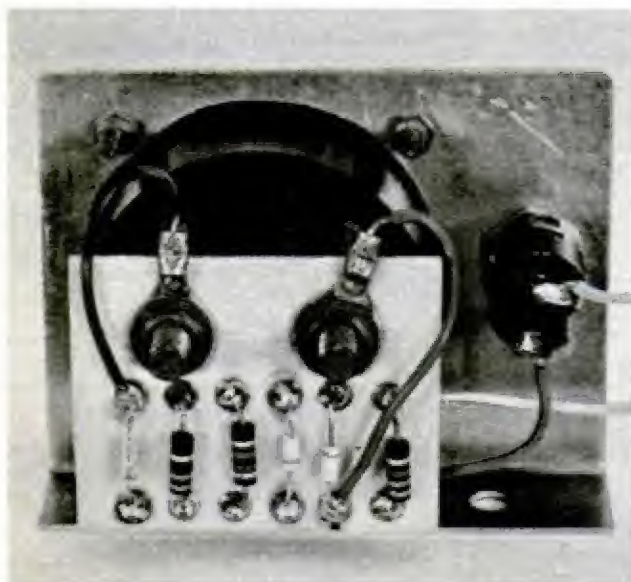
Take your car's pulse



TO CALIBRATE THE PULSE CHECKER, connect its input to the test-circuit terminals and push switch to "on." Needle then indicates where border between "OK" and "Bad" portions of meter scale should be

PARTS LIST

- D1, D2—Silicon diode, 400 PIV, .75-amp rating. (Radio Shack 276-1138; Lafayette 19 P 420.3; Olson TR-2168)
- D3—General-purpose germanium diode, 60 PIV, 5 ma. (type 1N34A; Radio Shack 276-821; Lafayette 19 P 15057; Olson TR-2108)
- R1—330-ohm, 1/2-w., 10% resistor (Radio Shack 271-017; Lafayette 32 P 3061; Olson RS-0098)
- R2—470-ohm, 1/2-w., 10% resistor (Radio Shack 271-019; Lafayette 32 P 3065; Olson RS-0108)
- R3—33-ohm, 1/2-w., 10% resistor (Radio Shack 271-007; Lafayette 32 P 3037)
- S1—S.p.s.t., normally-open pushbutton switch (Radio Shack 273-1547; Lafayette 34 P 34594; Olson SW-4528)
- M—Meter, 0-1 ma., 50-100 ohm, 2 1/2" square (Simpson) or 0-1 ma., 80-ohm, 1 1/2" x 1 1/2" (not shown; Radio Shack 22-018; Lafayette 99 P 50528)
- Misc.—Partboard or circuit board, hookup wire, solder, aluminum for mounting bracket (optional).



CIRCUIT BOARD can be mounted directly to meter terminals. Any board and parts layout can be used

tion of the scale dividing point, use the test setup shown—a voltage divider that drops a battery's 1.5 volts to about 0.22 volts. Connect the Pulse Checker's input across the 18 or 20-ohm resistor, and mark the division between the good and bad bands at the point where the meter needle comes to rest.

To hook up the Pulse Checker to your car, connect its positive lead to the primary terminal on the coil, the one that goes to the distributor. (If your car has a ballast resistor between the coil and distributor, connect the Pulse Checker to the distributor side of that resistor.) The negative lead must go to a good ground, preferably on the engine block; do not ground

it to the dashboard or other sheet-metal surface, as these points may not be properly grounded, which could cause false indications. (These connections are for negative-ground ignition systems, almost universal today. If your car has a positive-ground system, reverse the connections.)

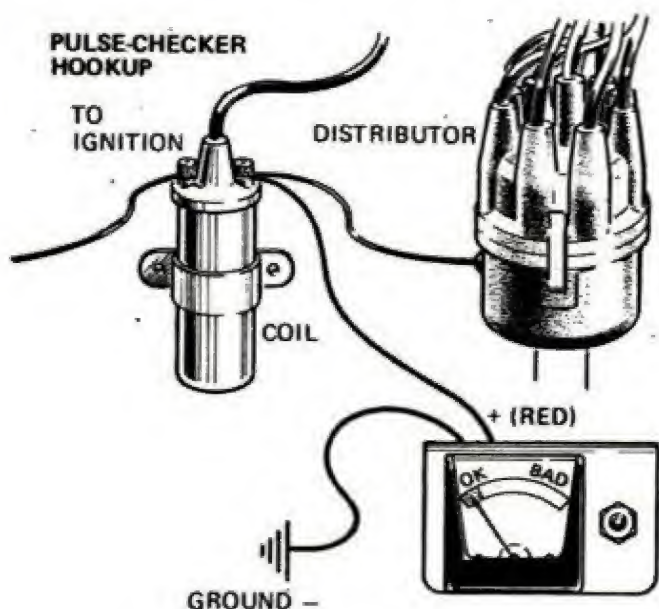
The Pulse Checker is actually a very sensitive low-voltage meter that responds to the resistance between the points as they are making contact (when the points are open, the test circuit is electrically disconnected). Since the points open and close several thousand times per minute, the Pulse Checker gives a continuous average reading of point condition.

Point contact resistance should, of

while you drive

By A. EDWARD EVENSON

Photos by Robert D. Borst



course, be as low as possible; as resistance goes up, coil current and output go down. So a "Bad" (high-resistance) reading tells you that the points are failing, even though the car still runs.

An erratic reading fluctuating between the OK and Bad bands is usually another indication of beginning point trouble.

The best speed at which to make the check is slightly above idle, or during slow city driving. While the circuit works at any speed, it is most sensitive to point conditions in this range.

On a few cars, you may find that the reading, while a steady okay or zero at speeds above idle, is unsteady at very low idle speeds. This is normal, and does not indicate bad points unless the unsteadiness persists at higher speeds.

About 99 percent of the time, a "Bad" reading will be due to bad points. But occasionally, it will be caused by a poor connection between the coil and distributor, or by a bad ground in the distributor breaker plate. This last condition will usually show up as a sudden change in reading as you vary engine speed slightly. Changing speed changes the position of the breaker plate, and therefore shows up bad grounding, if it exists.

New points may show high-resistance readings for a while, until their contact surfaces wear in. ★★★

PULSE CHECKER indicates condition of the ignition points. You can mount it on your dashboard, if room, or underneath it in a homemade bracket, as shown



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ideas coming
all over again!



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age, not gas tank.



Ford box cover fits
right, looks right.



Full-foam seat 5 in.
deep is standard.



Optional "air" is all
neatly built in.



Box sides are full
depth double-wall.



Front disc brakes
standard exc. 4x4.



Roomiest Ford ever
—quiet, comfortable.



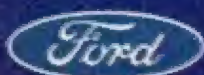
Twin-I-Beam, start
of Ford's great ride.

A better idea for safety:
Buckle up.



FORD PICKUPS

FORD DIVISION



Works like a truck/rides like a car.

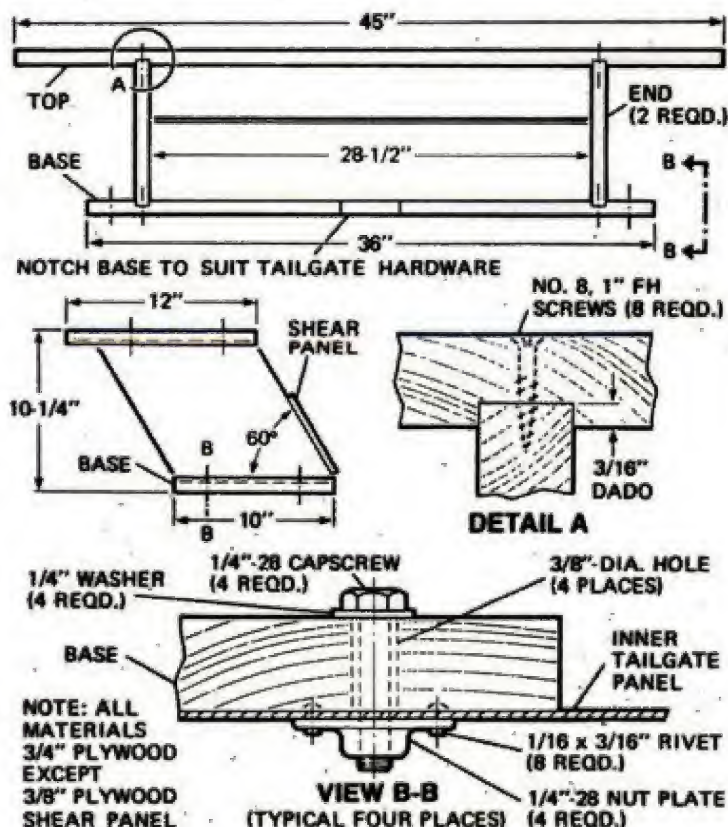
VIEW ON THE WORKBENCH is an on-the-job bonus. Roomy benchtop here is 36 in. from the ground (in this installation on a 1965 Ford Fairlane station wagon), can be varied to suit user. Below: Space under top stores large tools not in use. When tailgate is closed, shear panel holds large portable tools in bench for transporting



Tailgate workbench for your station wagon or pickup

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Dimensioned lumber may be used instead of plywood for base and top, if desired. To give the bench a convenient overhang when in use, mount it as close as possible to the edge of the tailgate. Start by removing the gate's inner panel, then clamp base to it and drill through both for four cap-screws. Rivet nut plates to underside of panel.—*H. M. Thomas*



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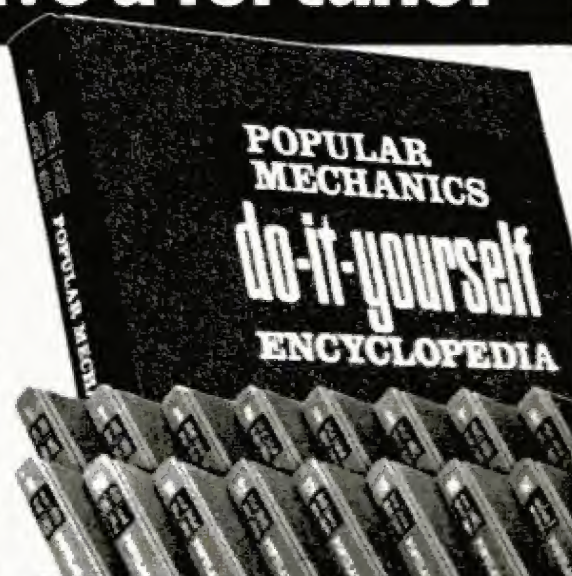
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IMPORTS AND MOTORSPORTS

BY BILL HARTFORD



FIAT X1/9 mounts the sohc, in-line four-cylinder engine midships in a transverse position. Radiator of water-cooled unit is up front with piping running in tunnel between bucket seats. Displacement is 1300 cc; U.S. version is expected to have 50 to 60 hp net. New car weighs slightly under 2000 lbs., has an 86.7-in. wheelbase, is 150.5 in. long, 61.7 in. wide and 46 in. high. Disc brakes are on all four wheels, radial tires standard, steering is rack and pinion. Roof stows in luggage boot in front

THE WRAPS ARE FINALLY OFF Fiat's all-new mid-engine sports car. We mentioned this two-seater replacement for the 850 Spider last year, but had no pictures of it (See *In the World's Most Exciting Cars . . . The Engine Is Breathing Down Your Neck!* page 112, Oct. '72 PM). The X1/9, as it's called, is in production now and will be available in the United States probably by the end of the year as a '74 model.

Middle-income enthusiasts will no doubt be lining the docks since the car has been very well received in Europe, and the price is expected to be in the \$3000 to \$3500 range. At that price it will give Porsche the bump from the low end of the mid-engine market, the 914 starting at \$4499. The X1/9 is similar to the 914 with pop-up headlights, front and rear luggage compartments and built-in roll bar with removable top.

If you're wondering about the mysterious X-one-slash-nine designation, it's simple: The mid-engine machine is the ninth car design done by Fiat engineers and stylists in Experimental Lab Number One.

Another new mid-engine car is also from Italy, but at the other end of the price scale. Guess is that the Ferrari Boxer will be anywhere from \$30,000 to \$40,000. So, until '74

when the Boxer is expected to be available here, you'll have to settle for the \$25,000 Maserati Bora—still the most sophisticated and expensive mid-engine car you can buy. The Boxer takes its name from the box-like flat-12 engine, a departure from Ferrari's usual V12 configurations.

Still another Italian-made, mid-engine design is one that should be familiar by now, but see if you can spot the changes Lincoln-Mercury has made on the Pantera. The most obvious changes on the new Pantera L, which



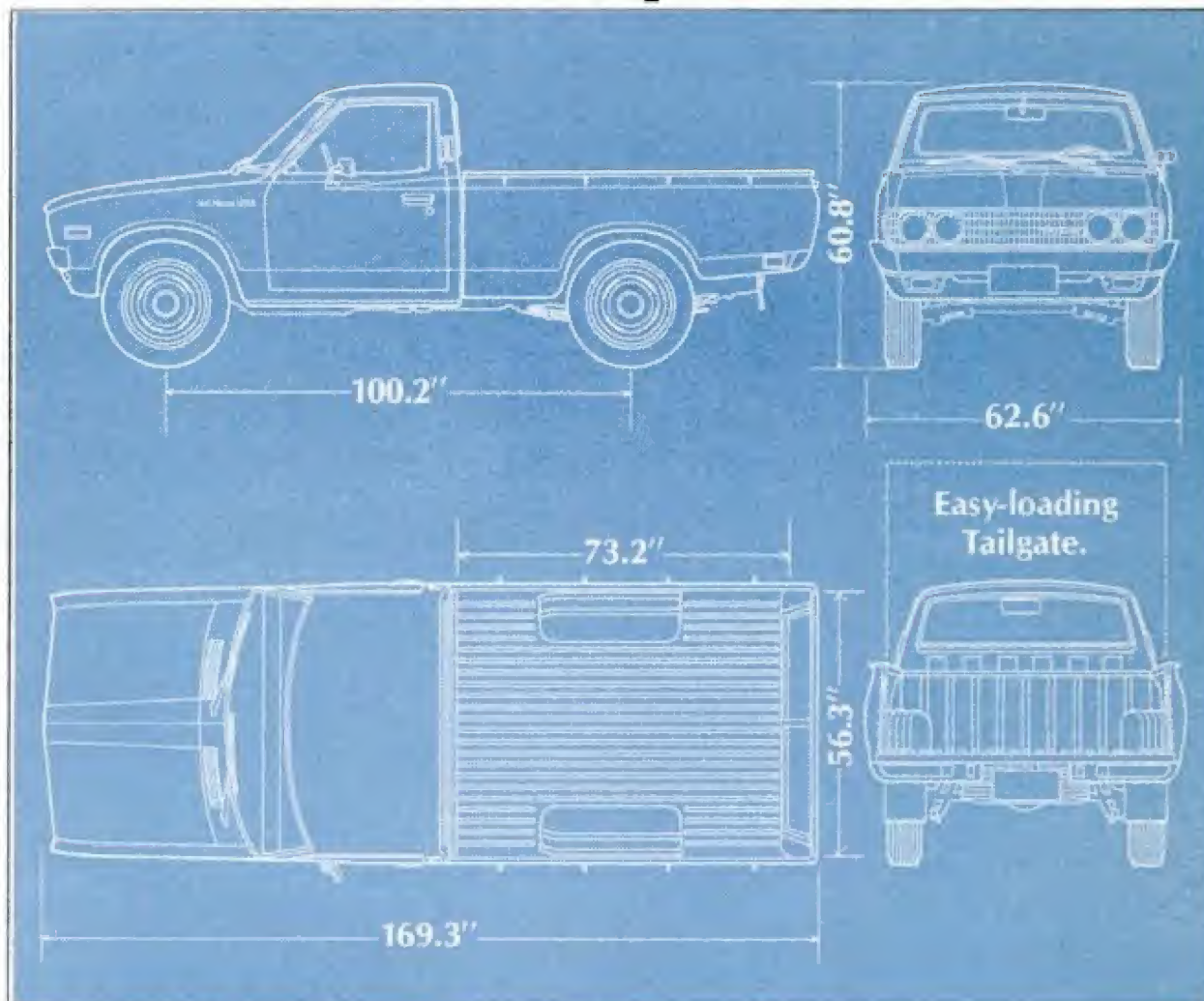
goes on sale this May 1, are impact absorbing bumper systems both front and rear. L-M has met the federal bumper standards and still kept the Pantera's knife-edge nose intact. Other changes are improved seats and larger, 60-series tires. The car continues with Ford's 351, four-barrel V8 and the long list of standard equipment. Another change is that Ford now fully owns the Italian production facilities and renewed attention to refining the Pantera should result in one "L" of a car.

(Please turn to page 70D)

POPULAR MECHANICS



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IMPORTS AND MOTORSPORTS

(Continued from page 70B)

ONE WOMAN WHO DRIVES with her foot in it is Michele Petit. So don't put your foot in it—your mouth, that is—making old jokes about women drivers. It's hard enough to finish the Monte Carlo Rally, but she won it. You can figure the difference between your street driving and her rally driving as roughly akin to the difference between stepping into a bathtub and diving into it from a 100-foot board. Teamed with Jean-Claude Andruet, Ms. Petit became the first woman to win the world's most prestigious rally in the 42 years it has been run. It was also a triumphant sweep for the Alpine Renault cars that took 1st, 2nd, 3rd, 5th, 6th and 10th!

At the same time the Alpines were devouring 1000 miles of European roads in all kinds of weather, Renault engineers were bench testing a new two-liter racing engine. The V6 will be fitted to a new Alpine open sports car to be raced in the European Prototype Two-Litre Championship. The engine has four valves per cylinder, double overhead cams, light alloy cylinder heads,



dry sump lubrication, fuel injection, electronic ignition and a compression ratio of 11.4:1. It develops 285 bhp at 9800 rpm and is designed to run with ease over 11,000 rpm—and will run with ease over a lot of competition, we bet.

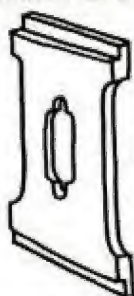
THE 200-MPH CLUB keeps growing. During tire testing in March, the Parnellis and Eagles were clipping the mark with ease. Top speed went to Mario Andretti who ran a record 211.765 at Texas World Speedway in the Viceroy Special. This year should be the fastest Indy. If you can't get to the Speedway, watch the same-day re-broadcast of the 500 the night of May 28. ★ ★ ★

Introducing a drill for the man who does more than just drill holes in wood.



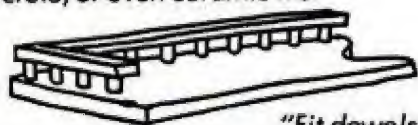
Sears Craftsman Type-1 is a $\frac{3}{8}$ " heavy-duty drill that can do it all.

1. The Craftsman Type-1 has ball bearings built-in at key stress points, it develops a full $\frac{1}{3}$ horsepower, and actually puts out more power than other similar drills.



"Cut through
an inch of pine
in seconds"

2. The Craftsman Type-1 also has the variable speeds you need to start and drill a hole exactly where you want it without skipping or skittering around. Whether you're going into wood, steel, concrete, or even ceramic tile.



"Fit dowels
with precision"

3. While the variable speeds also help you drive screws, the reversible action enables you to take them out, too.



"Drive or draw
screws with ease"

4. And, of course, the Craftsman Type-1 is double insulated so it requires no grounding. Its two-prong plug fits any conventional outlet.

Sears Craftsman Type-1 is also unconditionally guaranteed to give complete satisfaction for one year, or return to Sears for a free replacement.

Sears
CRAFTSMAN
TYPE I

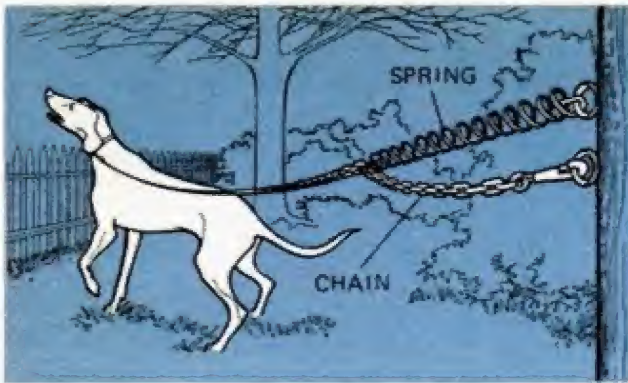
The drill that's designed for
the man who knows what he's doing.

The Craftsman Type-1 Drill, along with the accessories needed to build this desk, are available in Sears, Roebuck and Co. Retail Stores and in the Catalog. Craftsman Type-1 Drill Catalog Number 9 GT 1145.



(Complete plans for building this Captain's Desk are available in the tool department of most Sears stores).

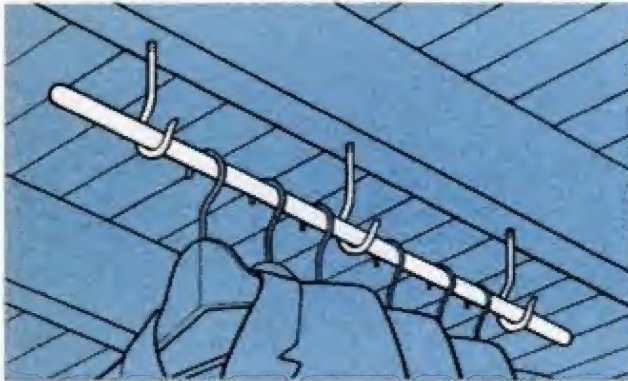
HINTS FROM READERS



Spring stops canine whiplash

A chained dog reaching the end of his tether with force can be kept from possible injury if you attach a firmly anchored screen-door spring to his lead near its fixed end. Leave as much slack as possible in the chain beyond the spring. Dogs are quick to learn to stop when they feel the spring's initial resistance.

—Vince Plesko, Superior, Wis.



Impromptu clothes rack

Extra hanger space can be created in a basement or attic by making a rack with heavy-gauge screw hooks and a broom handle. The hooks are screwed into exposed or covered joists and the handle is cradled in them. For a longer rack, a length of $\frac{1}{2}$ -in. pipe may be used instead of the broom handle.

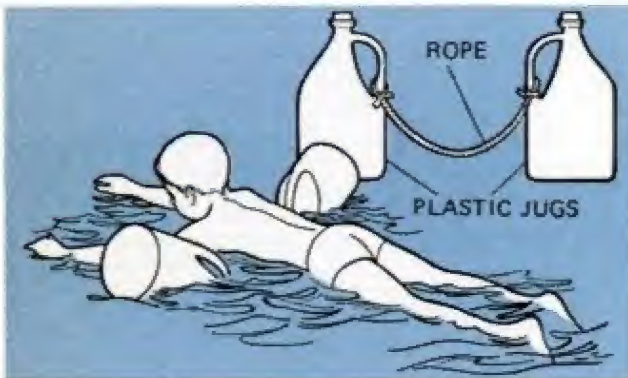
—Vince Plesko, Superior, Wis.



Sealing wicker-chair legs

I've found that the legs on wicker furniture may fray or split, so I've come up with a way of capping them. Set each leg in a paper cup just slightly larger in diameter and pour in two-part plastic-resin mixture to a depth of about 1 in. This will seal the legs, and produce improvised casters. The paper cups are peeled off.

—Otto Carlson, Idyllwild, Calif.



Jugs make water wings

For fun in shallow water, let the kids try a pair of water wings fashioned from two empty plastic jugs of the type bleach comes in. Tie a short length of rope to jug handles as shown and make the jugs airtight by closing with original caps. Wings are light, unbreakable, cost nothing; to use, a swimmer simply lies across the rope.

—John Krill, North Lima, Ohio



Toekick trick

I didn't want to use shoe mold when I remodeled my kitchen, but I did want to avoid the job of carefully fitting tile along cabinet toekicks. So before installing the cabinets, I ran a $\frac{3}{8}$ -in.-deep rabbet on the toekicks to hide the cut edges of floor tiles. The same trick could also be used in a bath remodeling job.

—Victor Lamoy, Saranac Lake, N.Y.

Here it is!

Popular Mechanics

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All the basic information on home gardening at your fingertips!



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climate

How to improve
your soil

Starting seeds

Trees

All kinds of
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Make Yourself Heard In Washington On Postal Increases

The United States Postal Service has started a series of second class postage rate increases that over a five-year period will increase the postage bills of magazines by an average of 127%. Anticipated increased Postal Service labor costs and continued inflation could make the final increase much higher. Some magazines could have increases of over two hundred percent, and many may cease publishing. The inflationary effect of these abrupt and enormous rate increases on readers, publications, and advertisers alike, are obvious. It is our feeling the only way to cushion its effect would be through giving the magazine industry a reasonable period of time in which to adjust to these increases.

Certainly the speed of these increases should be removed from the sudden death category which has now put many of our worthiest publications in real jeopardy.

The rapid escalation of these rates is actually counter to the original intent of Congress in the Postal Reorganization Act of 1970, which presaged a "gradual" increase. These increases are about as gradual as a guillotine. Only you, the reader, can do anything to prevent this. You can only act through Congress. In the House of Representatives, Congressman Morris K. Udall

has introduced H.R. 1248, a bill that will, in addition to some special relief for non-profit and small circulation publications, spread the second class rate increases over a ten-year period instead of five, to give the magazine industry as a whole time to adjust to this heavy new burden. Senators Edward Kennedy and Barry Goldwater plan to introduce similar legislation, and Senator Gale W. McGee, Chairman of the Committee on Post Office & Civil Service, has shown his interest by introducing legislation.

If you agree with them and with us—that this is a fair and reasonable request to make of Congress, fill in and sign the ballot below and mail it to me. I will send it on, in duplicate, to your Congressman and Senators so the force of your opinion will be felt in both Houses. Or, of course, you can write them direct. But time is of the essence since both these bills will come up in this Congressional session. So we respectfully urge you to do one or the other now, since only you can do anything about this at all.

Joseph F. Kern, Publisher
Popular Mechanics
224 West 57th Street
New York, N.Y. 10019

I agree!

I agree with the Publisher of Popular Mechanics Magazine that the postal bills of Senators Kennedy and Goldwater and Congressman Udall as proposed in H.R. 1248 are urgently needed to give relief to second class postage rates.

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Signature

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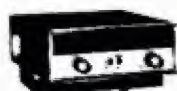
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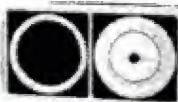
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HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Stuck fireplace damper

Recently I had the top of my chimney rebuilt and I think it likely that plaster has fallen and lodged above the damper to prevent it from opening. How can I get the obstruction out?—Russell Beebe, Lansing, Mich.

Some fireplace dampers are designed to be lifted out. Have you tried yours? If it won't lift, you'll have to try to dislodge the obstruction, using a 1/4-in. rod to probe along edges of the damper where there is usually sufficient opening to insert the rod or length of heavy wire. This should make it possible for you to force the obstruction upward, permitting the damper to open, at least partially, and allowing the plaster to fall through. For fireplace construction details, see *How to Have a Smokeless Fireplace*, page 76, Jan. '73 PM.

Shabby redwood table

My redwood picnic table has weathered to a dirty gray color. How can I make it look like new?—J. Lindsey, El Paso, Tex.

"Like new" may not be entirely possible, but you can rejuvenate it with a thorough sanding, starting with a coarse grade of sandpaper and working up to a fine sandpaper. Give the picnic table two coats of a redwood stain that's made especially for the purpose.

Salvaging a cracked mirror

I have a small mirror that's cracked diagonally near the bottom. Is there an adhesive that will rejoin the two parts? The break is clean; not shattered.—George Olson, Denver.

There are colorless adhesives (for example, Scotch Super Strength adhesive, available in tubes at most hardware, variety and department stores) that will bond glass to glass quite effectively. Joining the glass is tricky, however, the problem being to obtain as nearly as possible an invisible joint.

Such adhesive sets almost instantly with little pressure. If you try it, have every-

thing at hand and be ready to work fast. If the mirror needs resilvering, have it done professionally.

Flood-damaged hardboard wall

A recent flood damaged the powder room in my basement. The walls are wainscoted with imitation-tile hardboard; one has bulged badly, while the other three have flattened out, or nearly so, apparently without damage. Will the bulged wall also flatten out?—J. Tolliver, Richmond, Va.

I don't know how your walls are framed so I can offer no positive solution. The framing may have shrunk sufficiently while drying to stress the hardboard on one wall, causing the bulging. Wait a while, noting at intervals if there is a change for the better. If not, I'd remove the panel, plane off a fraction of an inch or so from the top and ends and then replace it, after making sure the panel is free to move at ends and top. I assume that the exposed edges are housed. If the panel is not otherwise damaged, the defect may correct itself in time.

Cleaning an oil painting

I have an oil painting, not especially old or valuable. This heirloom has been face up in an attic for years and is covered with grime. How do I clean and brighten it?—Jim Atle, Little Rock, Ark.

Professional restoration of art is beyond the scope of this department. However, I've had fair success cleaning several oil paintings by sponging them lightly with a mild soap solution, such as Ivory, and using a soft, clean paintbrush (preferably new) to loosen the embedded dirt and grime. Keep the surface wiped or sponged to remove excess soapy water and rinse with clean water after each application of the soapy solution. Don't use a detergent.

After the surface has dried thoroughly, I've always applied a copal varnish, which you can purchase from dealers in artists' supplies. You should be especially careful to apply a smooth, uniform coat of this varnish. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems of wide interest will be discussed in this column.

Your menthol tasting rough?

Only KOOL with pure menthol
has the smooth taste
of extra coolness.



Come up to KOOL

KOOL Milds 14 mg. "tar," 1.0 mg. nicotine av. per cigarette, by FTC method. KOOL Kings 18 mg. "tar," 1.5 mg. nicotine; KOOL Longs 18 mg. "tar," 1.4 mg. nicotine av. per cigarette, FTC Report Aug. 72.

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14 mg. tar,
1.0 mg. nicotine

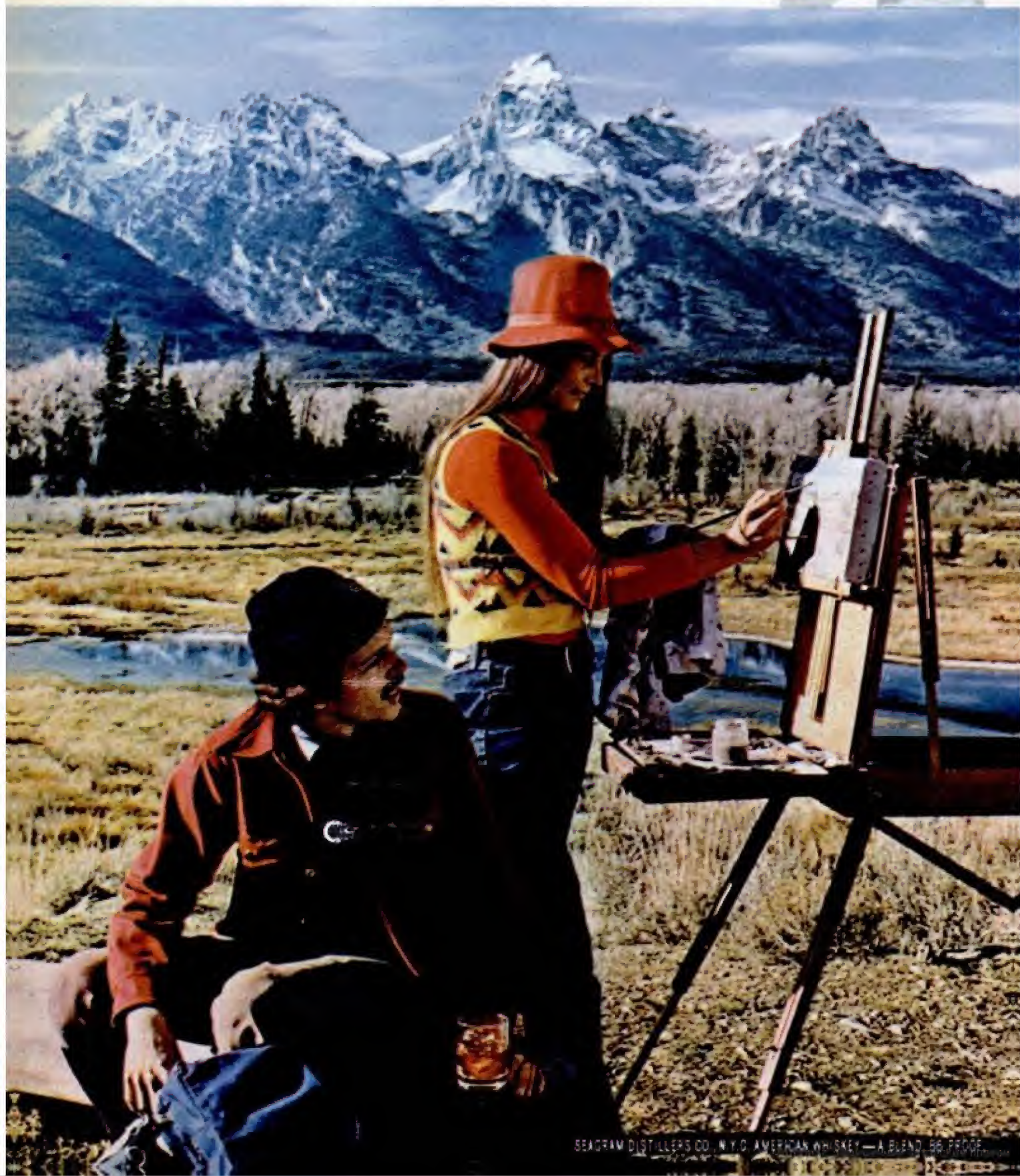
Warning: The Surgeon General Has Determined
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Seagram's 7 Crown. It's America's whiskey.

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If there's a weekend home in your future...

By RALPH C. RITTENOUR



FIRST PHASE, PLAN 875 ▲

▼THIRD PHASE, PLAN 875

WHO KNOWS, this may be the year you kick the habit—the habit of spending humdrum weekends at home rather than exciting ones away in lake or ski country. The best way to fully enjoy a weekend is for you and your family to get away from it all. With a home away from home, you can look forward to a mini vacation almost every week.

But what kind of home are you going to build? To help you decide, PM has rounded up five great ones for you to dream over, shown here and on the next 10 pages.

KEYED to simple construction, the starter has plywood siding with battens and shingle roof. Third step of five-stage program illustrated below includes two more bedrooms, living room with fireplace, an entry hall and front deck



Expandable weekender

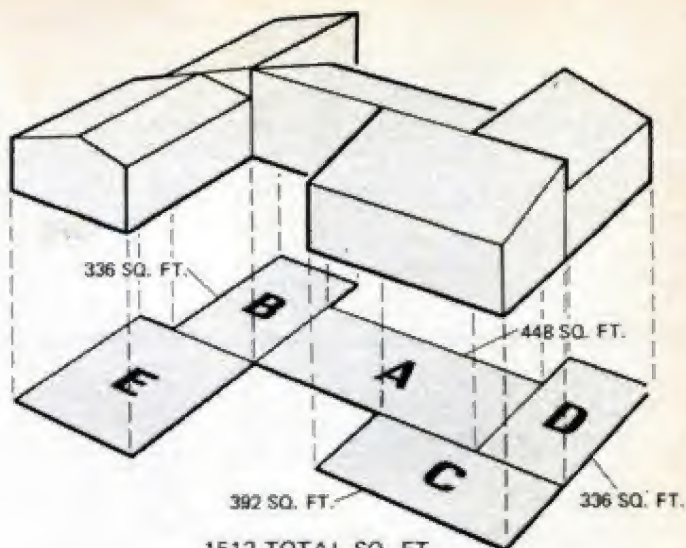
HERE IS A WEEKEND HOME you can build in five stages. Living area of 1512 sq. ft. is an outgrowth of a starter house that included only 448 sq. ft. From the original unit of U-shaped kitchen and family room plus bathroom and laundry, the home has grown to provide three generous-sized bedrooms, living room with fireplace, a second bath and a centrally located entry hall. Abundant storage includes guest closet, walk-in closet of master bedroom, wardrobe units and built-in cabinets.

Besides adding more living space as the home is expanded, the designers have anticipated the details of construction. Rough openings for future doors and windows are built into the structure so that remodeling is simplified and only the removal of siding or interior wall is necessary to add on the adjacent room or hallway. When wiring the original starter unit, a service panel is installed with the necessary circuits for completing the home as planned. Wiring is carried down to the bottom of the floor joist and terminated temporarily for easy future access.

FIFTH PHASE, PLAN 875



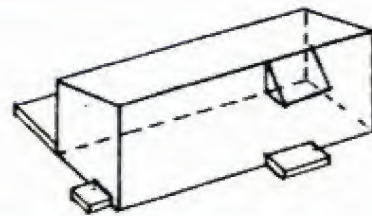
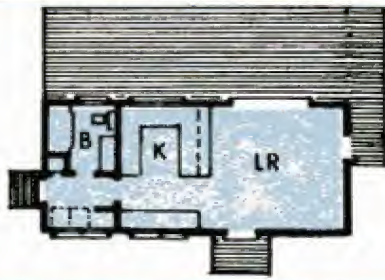
Careful thought has also been given to future plumbing additions. Capped fittings are easily used for later connection as the building expands. Needs for flashing are also anticipated so future additions do not require removal of old flashing and the use of new material. Plywood roof and floor have been designed in modules along with other techniques to eliminate cutting wastes. Foundation access openings and future connections are anticipated. The final exterior of the home is covered with shingle siding over the plywood exterior after removing the batten strips.



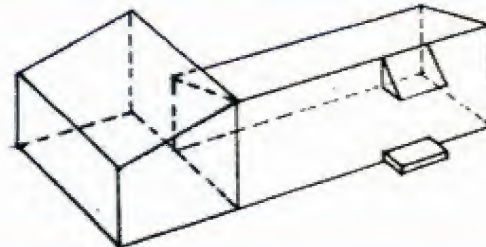
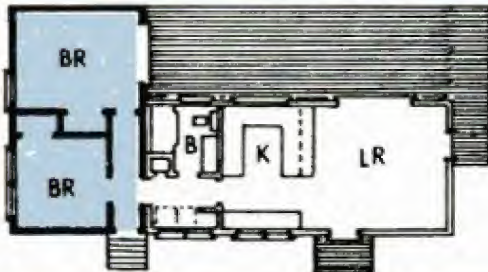
1512 TOTAL SQ. FT.

SEE NEXT TWO PAGES FOR KEYED PHASES

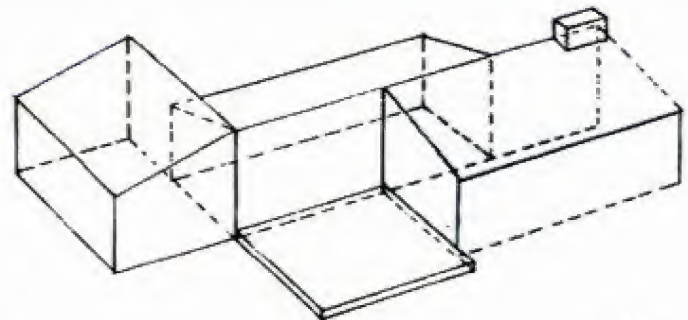
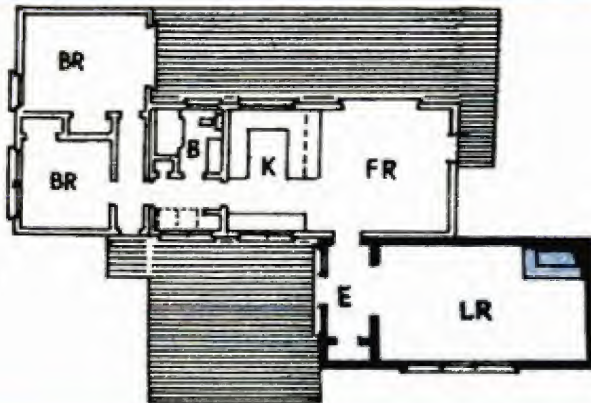




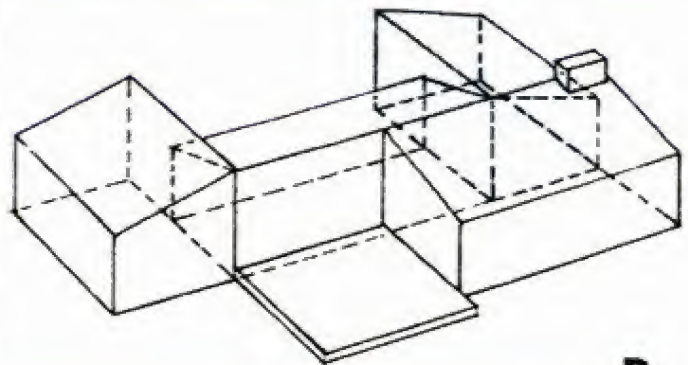
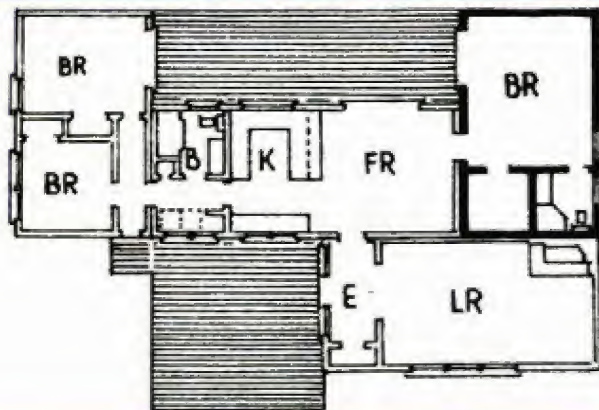
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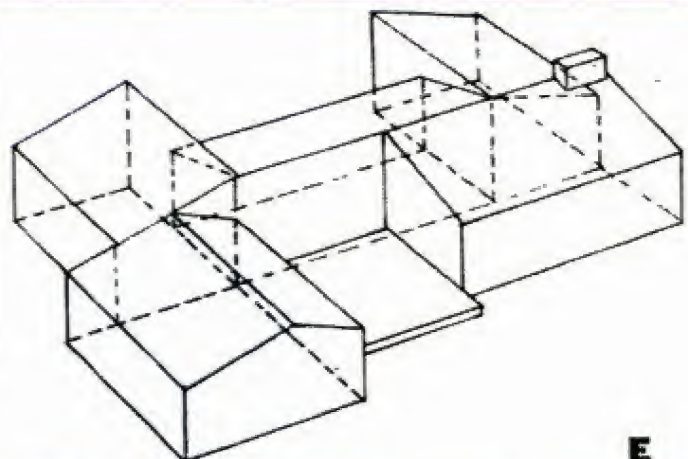
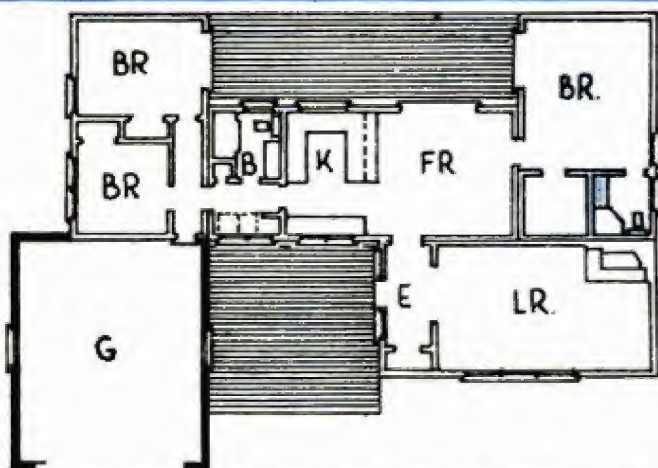
B



C



D



E

STARTER UNIT of this five-phase building program is a rectangular structure (32x14 ft.) comprising a living-sleeping space (15 ft. 2 in. x 13 ft. 3 in.), a fully equipped kitchen (8 ft. 3 in. x 13 ft. 3 in.) with 7-ft. 6-in. dining bar, a full-size bath and ample space for laundry equipment. The livable floor area of this modest starter unit totals 448 sq. ft.

THE NEXT BASIC NEED in this expandable home, as envisioned by the designers, would be more sleeping space. Thus, the second unit (24x14 ft.) contains two bedrooms (13 ft. 3 in. x 10 ft. and 10 ft. x 10 ft. 6 in.). This initial expansion unit consists of 336 sq. ft. of space, which when added to the first unit gives you an enlarged floor area of 784 sq. ft.

MORE LIVING SPACE would likely be the next major requirement in a second expansion of the plan. This addition (28x14 ft.) offers an entry and a new living room (22 ft. x 13 ft. 3 in.) with a built-in fireplace unit. With this change, the old living room will now serve as a family room or dining room. The additional 392 sq. ft. ups total floor area to 1176 sq. ft. However, if your need for more sleeping room is urgent, you could add the next expansion step ahead of this one

AS A FINISHING TOUCH to improve the comfort and acceptability of this expandable home, a master suite (24x14 ft.) is now added just behind the living room and adjacent to the area that served as the original living room before it was converted to a family room. A large bedroom (13 ft. 3 in. x 16 ft.) in the master suite is serviced by a walk-in closet (7 ft. x 6 ft. 10 in.) and a private bath. The additional 336-sq.-ft. increases the final amount of livable floor area to 1512 sq. ft.

THE FINAL UNIT to complete the home is a two-car garage (20x24 ft.), a part of which could be used to shelter a boat, snowmobile, lawn equipment or other outdoor recreational facilities—even to provide a storage place for fireplace wood. Access to the rest of the house is made at the garage rear through the door to the hall in the two-bedroom wing. Location of garage completes the H-shape of an expanded floor plan offering three enclosed sides for large front and rear patios

When you order plans for this starter expandable home, one or four sets each of the five stages are provided in accordance with your request. Plans for one stage only will not be furnished as all stages are related to each other. There are reasons for this that you should understand. Most important is that the individual plans for each stage have been designed to show the amount of construction involved in building each particular phase. When you go from the starter plan to the second stage, plans specifically show how to add to the home and cover details for only the new part of the construction with appropriate reference to what was originally built.

In similar manner, plans for phase two

How to order plans

You can purchase complete plans for any home featured in this article for \$35 for one set or \$50 for four sets of the same plan. Add \$5 for a materials list. Four sets are needed for permits, estimates, financing and construction. A plumbing diagram and a wiring diagram, helpful for those intending to do work themselves, are available for \$5 each. Send orders to Home Building Plan Service, Dept. PM, 2235 N.E. Sandy Blvd., Portland, Ore. 97232. Specify plan number and number of sets you want.

show the addition of two bedrooms. The third stage provides for the addition of the living room and entry hall plus the masonry fireplace. The fourth step includes all the information required for adding the master bedroom, walk-in closet and second private bathroom. The completion plans show how the double garage is added to the side of the entry deck with access to the two-bedroom wing.

Plans have been drawn in this special manner not only to show you or your builder how to go about the project, but also to help you obtain building permits and finance any stage of the construction. In the latter connection, the value of a plan of this type is enhanced by the potential of adding to its size and increasing the number of desirable features. It is recommended that you order the four sets of plans for each stage as they will be needed to fill your needs as outlined above. A list of building materials can also be ordered to expedite construction.

The loft lodge, Plan 876-14

THE ANGULAR MANNER in which the ceiling of this home extends over the living space below adds an attractive appearance to the windows at each end of the room and the masonry fireplace. The open stairways and balconies are used in conjunction with the window walls to create a feeling of coziness and comfort. The first

floor, with no major doors to inhibit relaxed movement from area to area, is open and spacious; yet all the while each separate zone retains its own identity and privacy when desired.

One end of the living room, which is over 31 feet long and over 15 feet wide, can be used as a dining space as illustrated by the interior picture. The remaining portion of the 960-sq.-ft. main floor level is utilized for the careful arrangement of a master bedroom with two

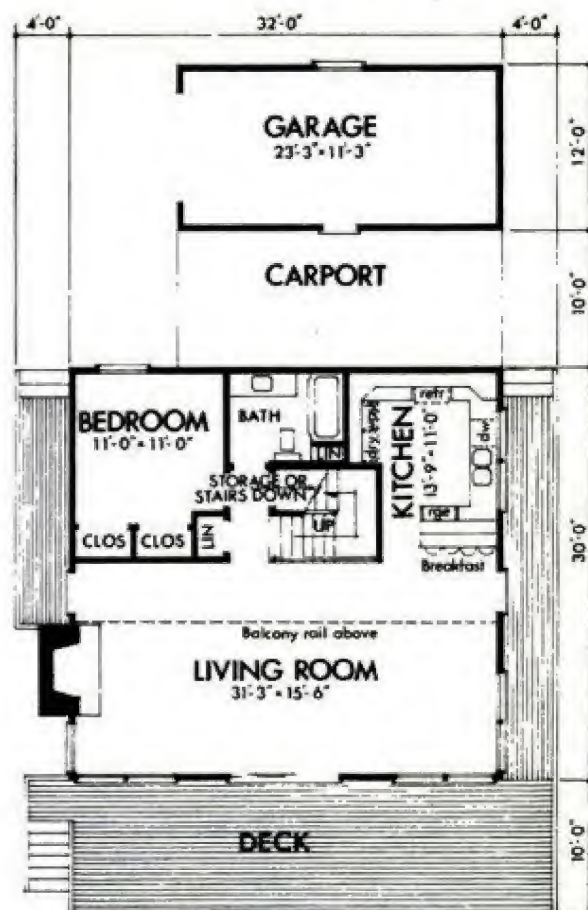


closets and an adjoining full bathroom, plus space for the winding open stairway to the second level. Kitchen working plan is U-shaped with a projection of the counter space that creates a place for the built-in range. Two upstairs bedrooms and an adjoining bath are connected by an open balcony that extends the full length of the living room.

Plan No. 876-1, a variation, includes a basement with a staircase located under the steps that lead to the second floor.

FIRST FLOOR
PLAN 876-1A
(without basement)

PLAN 876-1
(with basement)



FIRST FLOOR



SECOND FLOOR



**A-frame house: maximum
comfort at minimum cost**



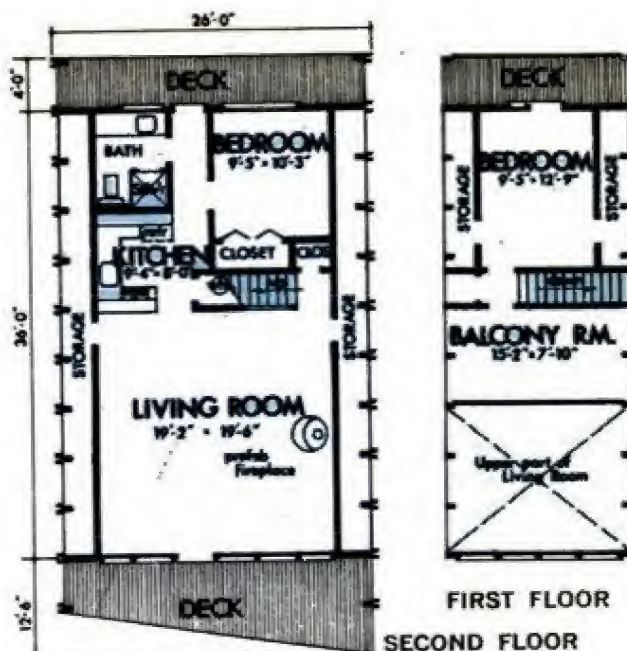
Panavista cottage



ONE OF THE MOST POPULAR recreation-home plans is the A-frame. Ever since the boom in recreation housing started several years ago, the A-frame has consistently been a favorite.

One reason for its popularity may be that the spirit of the A-frame is the complete opposite of most of our full-time box houses, and its soaring, free lines carry with them an unusual appeal. It is also true that when people get away from their daily surroundings they wish to have their leisure home look as unlike their everyday neighborhood as possible. The drama of this structure gives a definite sense of departure from the normal, a feeling of holiday living.

Its simplicity is another reason for its popularity, as is low cost, because the A-frame offers an economical way to build. Close study of this plan will reveal how this A-frame has all the most desired features. Notice both the front and rear door access. A U-shaped kitchen, a complete bath with a choice of either shower or bathtub, and two bedrooms plus an overflow balcony room are some of the best features. There's abundant storage behind the perimeter wall and the convenient closet space. The prefab fireplace can be located wherever the owner desires. The roof is covered with handsplit cedar shakes.



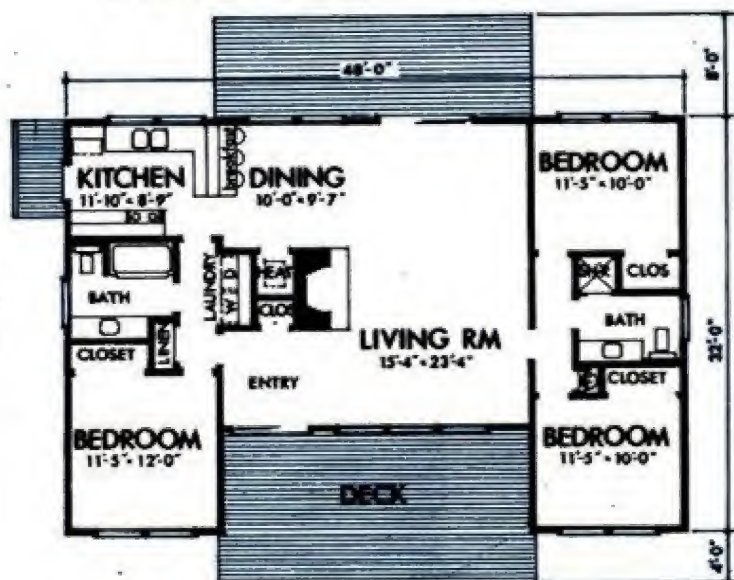
FIRST FLOOR
living area
702 sq. ft.

Plan 726-2

SECOND FLOOR
living area
288 sq. ft.



Plan 871-1A



MAY 1973

FOR VACATION or retirement living, this little gem of a plan encompasses a modest 1324 sq. ft.

The simple, economical lines of the exterior leave you unprepared for the richness of the interior beamed ceiling that prevails throughout the house, except in the baths and halls. A spacious living room featuring an oversized fireplace with raised hearth, offers a window-wall view to both front and rear garden. Friendly open living is promoted by the adjoining dining space, breakfast bar and kitchen area. A handy service core including washer, dryer and furnace, occupies the area behind the fireplace.

Plans include a single or double garage. Specify your choice when ordering plans.

Eight-sided round house

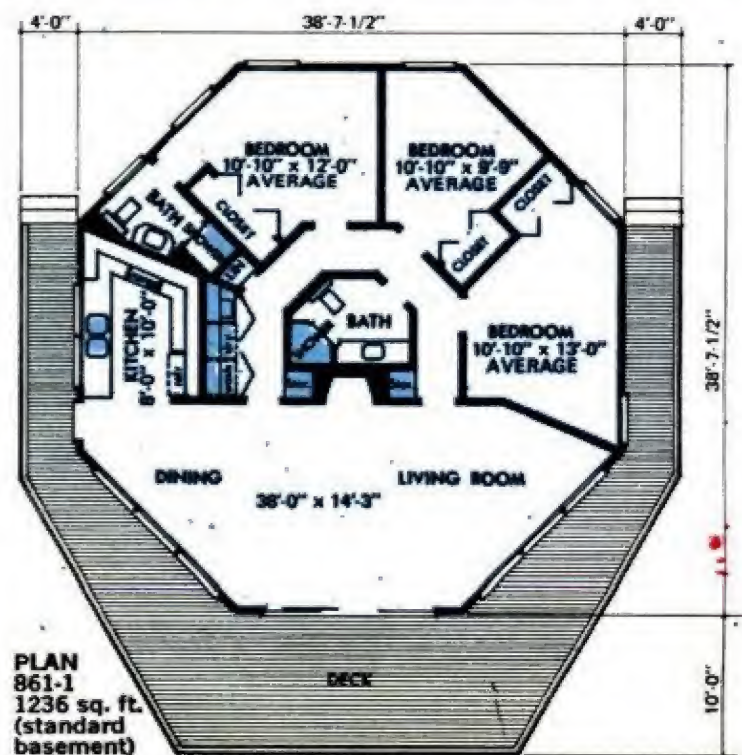
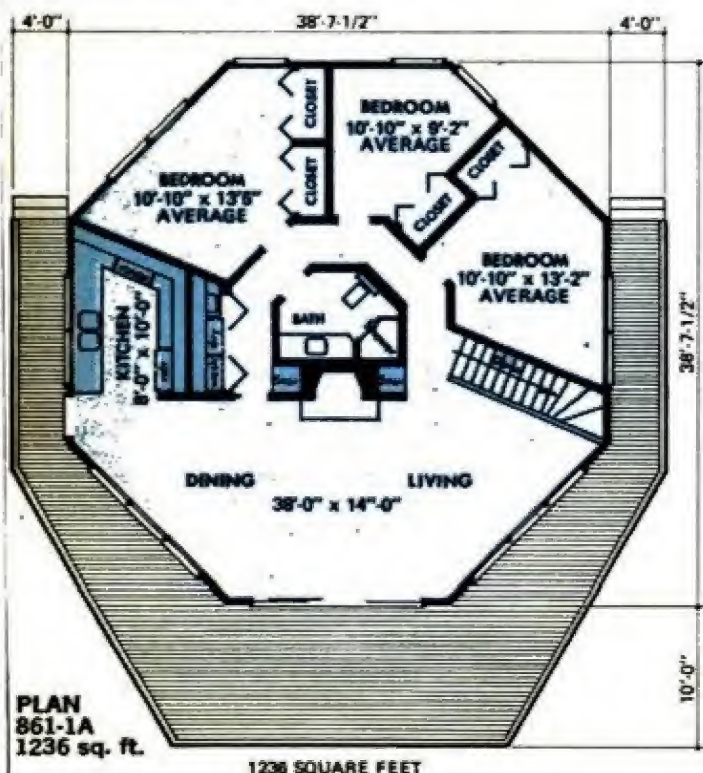
THE ROUND HOUSE has become a recognized mode of design for areas where both the house and deck orient themselves to valley vistas and have a direct rapport with the outdoors. The house is ideally suited for the crest of some promontory.

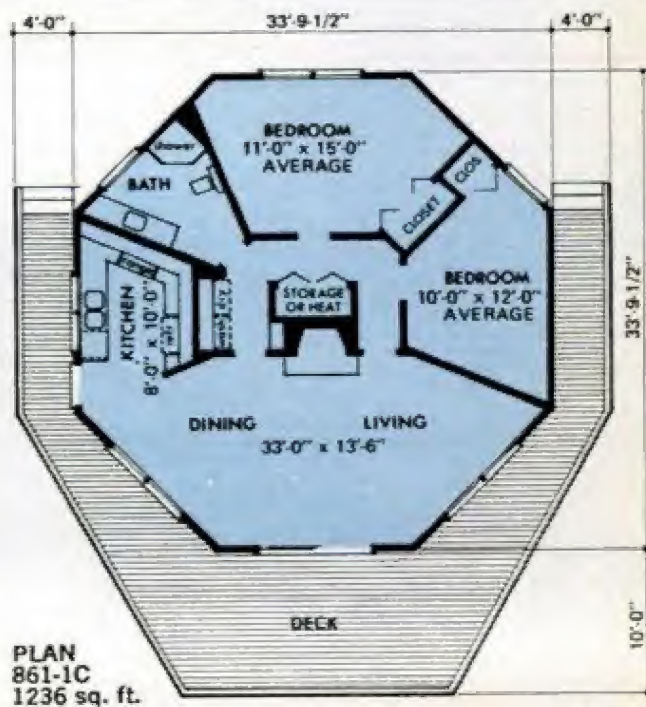
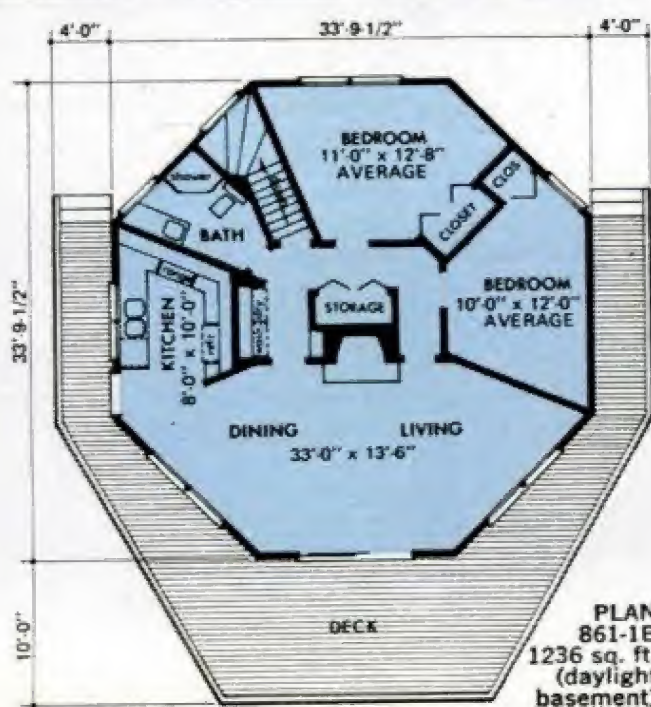
An exhilarating feeling of height is created by the manner in which the exposed beams radiate from the center of the roof to the exterior walls of the home. The beams, rafters and roof decking in the living room are structural, but also inherently decorative.

This unusual plan is being offered in both a two-bedroom and three-bedroom size. After careful study of the floor plans, you will note that plans No. 861-1A and 1B have three bedrooms and a choice of one or two bathrooms. Whereas plan No. 861-1A has no basement, the other one, plan 861-1B, has a daylight basement with a stairway leading down from the end of the living room.

The smaller plans, 862-1A and 1B, each have two bedrooms. Both designs are also available with a standard basement—that is, without the daylight basement wall, a feature that is limited to sites having the proper slope for it.

A spacious wraparound deck is characteristic of all of these plans and extends for a distance of 10 feet opposite the sliding glass doors serving the 33-ft.-long living and dining room.







Whatnot shelf

Cobbler's bench lamp



Strawberry barrel



Five wonderful projects you can make for your home and yard

- Strawberry barrel
- Cobbler's-bench lamp
- Desk accessory
- Period whatnot shelf
- Child's doggie desk

Color photos by Robert D. Borst

Strawberries by the barrel

By WAYNE C. LECKEY

PLUCKING STRAWBERRIES from a barrel on your patio may sound crazy, but what a treat! Like fruit on a bush, berries grown in a barrel are a lot cleaner than when grown in a strawberry patch—and a lot handier. And as a center of attraction, a strawberry barrel is sure to make conversation.

A strawberry barrel doesn't have to be on a patio, of course. It can be located anywhere as long as there is plenty of sunshine. It should be placed, however, on a level concrete slab and fitted with casters so the barrel can be turned occasionally to expose all plants to direct sun. Two husky chest handles attached to opposite sides near the top will facilitate turning it.

Everbearing varieties of strawberry plants, considered best suited for barrel growing, produce fruit from 60 to 90 days after planting. Strawberries can be planted as soon as danger of frost has passed.

Any 50-gal. wooden barrel, new or used, will do as long as it has a good solid bottom. Holes in the side should be 1½ in. in diameter and 6 in. apart in 4 or 5 rows. You can bore 8 to 9 holes per row, which will provide for 32 to 45 plants, plus 10 more on top. The rows should be reasonably even on a horizontal plane and staggered vertically. A hole saw in an electric drill will bore the holes quickly.

The plants are watered through a stand-

MAY 1973



OLD BARREL CAN BE PAINTED, new one stained and varnished. Treat the inside with wood preservative



PLANTS ARE WATERED through a perforated pipe in center of barrel. Rows of holes let water seep out

pipe placed in the center of the barrel. It's a section of common aluminum downspout cut to stand an inch or so above the top of the barrel. One end is closed and rows of small holes are drilled at random along its length. When in place, the pipe is filled with vermiculite or coarse gravel to allow the water to seep slowly out the holes. When filled, the barrel will weigh a good 500 lbs. so use heavy-duty swivel-type truck casters to support it.

Use a soil mixture of well-rotted cow manure, garden loam and sand— $\frac{1}{3}$ each of sand and manure by volume and the balance loam. Place a layer of broken clay flowerpots in the bottom of the barrel first. Then start adding the soil mixture up to the first row of holes and water to firm it. Now carefully insert the plants in the holes, spread the roots, fill with more soil and wet down gently. Continue until all the holes are planted. The plants in the top of the barrel are spaced about 4 in. apart. After the plants are established and actively growing, they can be forced to grow more rapidly by adding nutrients to the water. Watch, of course, that you don't

90



FOUR TRUCK CASTERS are attached securely to the bottom of the barrel with short lagscrews or bolts



FIVE DRAIN HOLES are bored through the bottom of the barrel and later covered with broken clay pots

overwater. When berries start to ripen, you may have to cover your barrel with cloth netting to keep the birds from eating them. This can be in the form of a lift-off cage made of wood strips with the netting stapled to it.

New 50-U.S.-gal. wood strawberry barrels can be bought drilled from Sweeney Cooperage, Ltd., 49 Smythe St., Vancouver 3, B.C., Canada, for \$15 f.o.b. ★★



STANDPIPE IS CLOSED at bottom with an aluminum scrap "welded" to pipe with an electric glue gun

POPULAR MECHANICS

ILLUSTRATIONS BY MICHAEL J. HARRIS

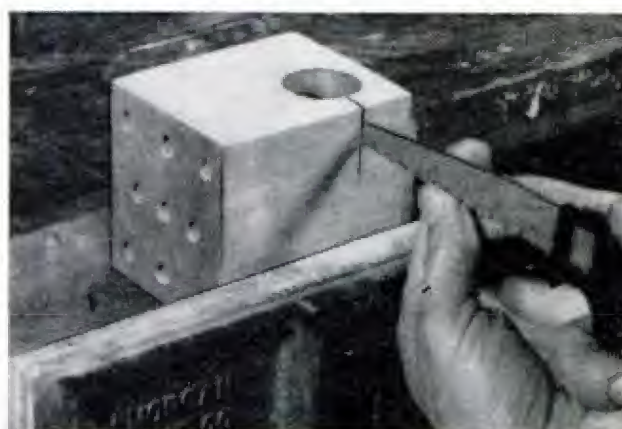
Stamp and pencil set

By C. WAYNE CLOSE

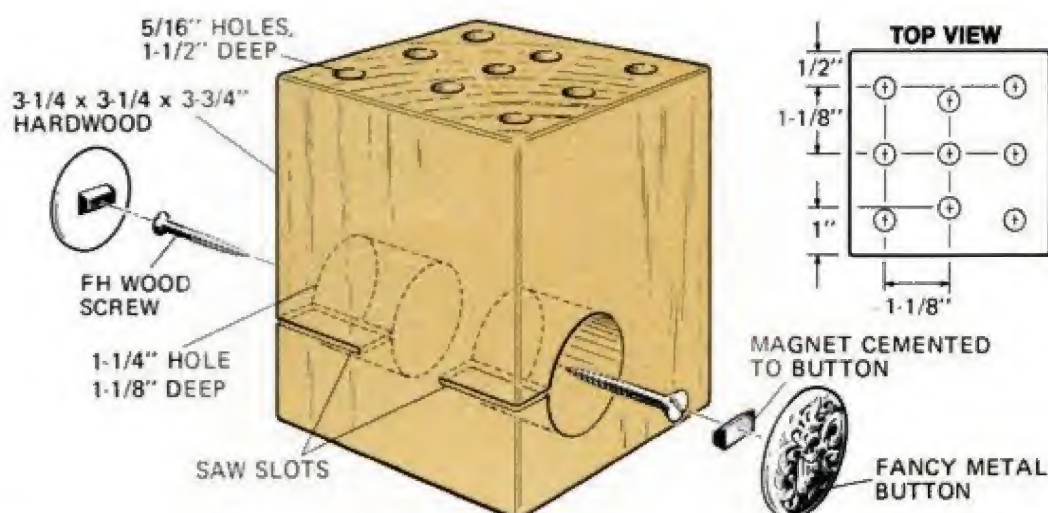
YOU'LL ALWAYS KNOW where to look for postage stamps when you have this novel dispenser on your desk. That goes for pens and pencils, too. It will hold two rolls of 100 stamps each, which are pulled out through slots in the side.

Wells for the stamps are bored in opposite sides of a hardwood cube (such as cherry or walnut) $\frac{1}{2}$ in. up from the bottom and $\frac{1}{2}$ in. in from the side. Entering kerfs are made through the side of the block with a thin-blade saw. Fancy metal buttons provide covers for the stamp wells and are held in place by small magnets that contact the heads of wood screws. The magnets are cemented to the backs of the buttons, and the screws around which the stamp rolls revolve are turned in far enough to bring the buttons flush.

Holes for pens and pencils are drilled down into the end grain of the block for a depth of $1\frac{1}{2}$ in. and countersunk slightly. Complete by sanding the wood flawlessly, particularly the top of the block, and breaking the sharp corners. If the wood is open grain, you should apply a paste wood filler after staining, rubbing it off across grain. Finish by applying three coats of self-rubbing polyurethane varnish. When dry, glue a piece of green felt to the bottom of the block. ★ ★ ★



POSTAGE-STAMP SLOTS in side of the block are cut through into stamp wells with thin-blade keyhole saw



Cobbler's-bench table lamp

By ELMER VERBURG

WHEN YOUR FRIENDS see this charming little table lamp, you won't stop with one—you'll wind up making several. Made in the form of an old cobbler's bench from scraps of clear white pine, the lamp is more than just a lamp. It has a rack for letters to be mailed, a handy little drawer for stamps and a place for a live or artificial plant.

It's a project you can quickly mass-produce with workshop tools. The straight and slanting grooves for the letter rack can be run on your table saw. The 15° holes for the legs can be bored uniformly with a simple jig clamped to your drill press. The flowerpot hole can be cut neatly with a hole cutter, and the hole through the square tapered lamppost can be bored from each end with a 1/4-in. wood bit. The upper end of the post is counterbored for a 2-in. length of 1/8-in. fixture pipe turned tightly into an undersize hole. The lower end is whittled round to fit a 7/8-hole. A standard brass pushbutton socket is screwed onto the pipe.

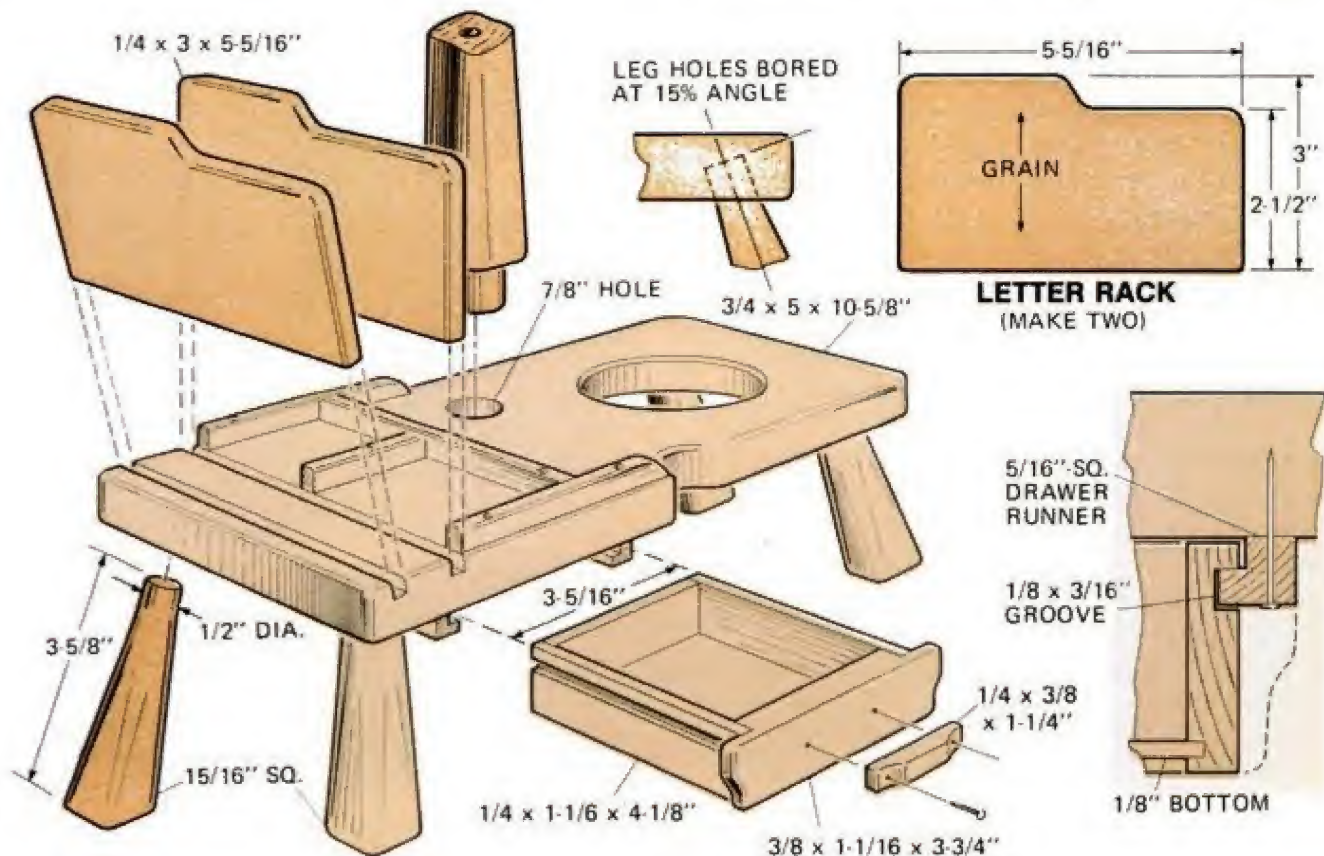
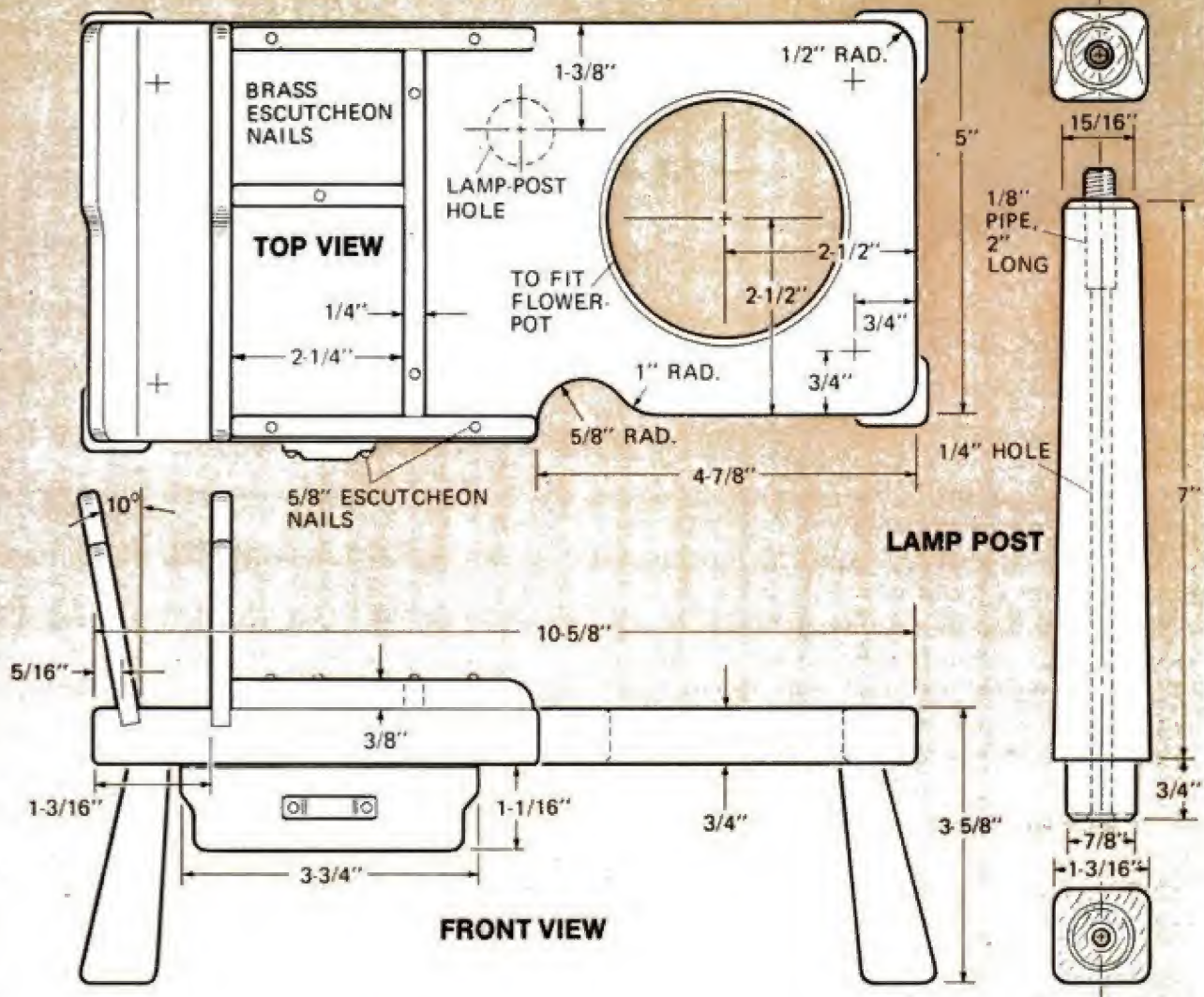
To produce an antique look, round off all sharp edges with fine sandpaper and distress the wood by sanding worn spots at points which would receive wear, like the seat, the drawer front and the letter rack, always sanding with the grain. Then go over the whole thing and "polish" the wood with a worn piece of extra fine sandpaper.

Coat the wood with a brown pigmented wiping stain, let flatten, then wipe off leaving it heavier in the corners and imperfections. When the stain is semidry, dip a cloth pad in turpentine and add highlights here and there by deftly wiping away some of the stain at the worn spots, the cheeks of the legs, the drawer pull and other places. Let dry overnight, then apply three coats of self-rubbing polyurethane varnish, sanding lightly between coats. Complete by wiring the socket. ★ ★ ★



GROOVES IN DRAWER slide on L-shape runners. Fit socket with a 40-w. bulb and a 10-in. clamp-on shade

POPULAR MECHANICS



Doggie doodle desk

By LAWRENCE REES

SITTING ASTRIDE FIDO makes coloring and doodling twice the fun for preschoolers who use this novel desk. The dog's saddle seat takes the place of a chair, the holes in his head provide a handy place to keep coloring pencils and his "tripod" legs form solid footing.

If you can obtain a sinktop cutout from a local cabinet shop for the desktop, a 3x4-ft. piece of $\frac{3}{4}$ -in. plywood will do for the rest. Many times lumberyards will sell leftover counter cutouts, which make a dandy writing surface and are usually sold at bargain prices.

Buy exterior A-A grade plywood since both sides of the body and legs will be seen. Your first step is to enlarge the patterns full size on wrapping paper. Rule off 2-in. squares, drawing the same number of squares as given in the magazine. Now copy in each 2-in. square the same portion of the outline that appears in the corresponding square of the small pattern.

After cutting out the paper patterns, arrange them on your plywood in the order shown and saw out the parts. If you must, you can do the sawing by hand with a keyhole saw, but sawing goes a lot faster with a sabre saw. Try to keep the various interlocking notches a uniform $\frac{3}{4}$ in. wide to assure a snug fit. Notice that the scrap between the front legs becomes the seat.

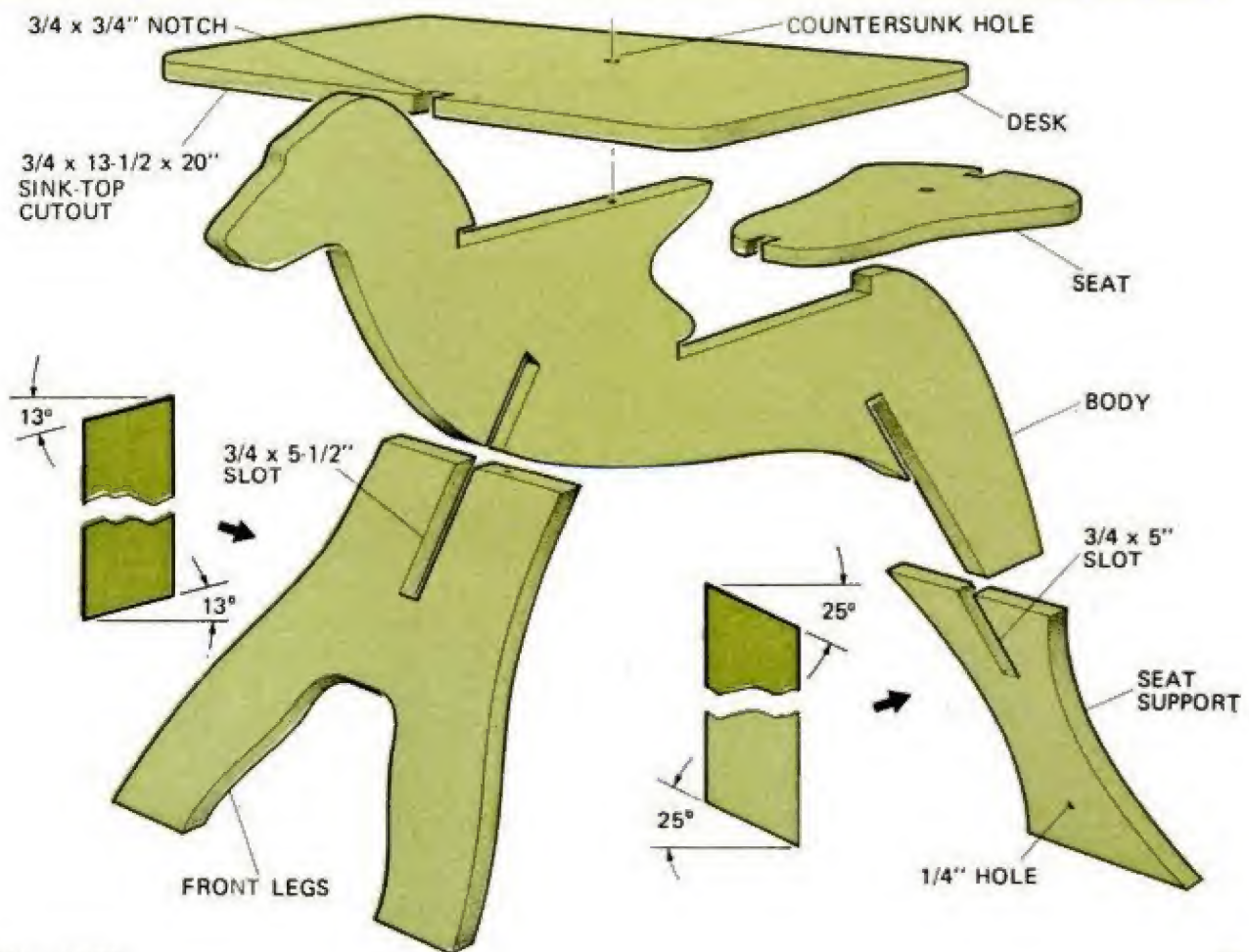
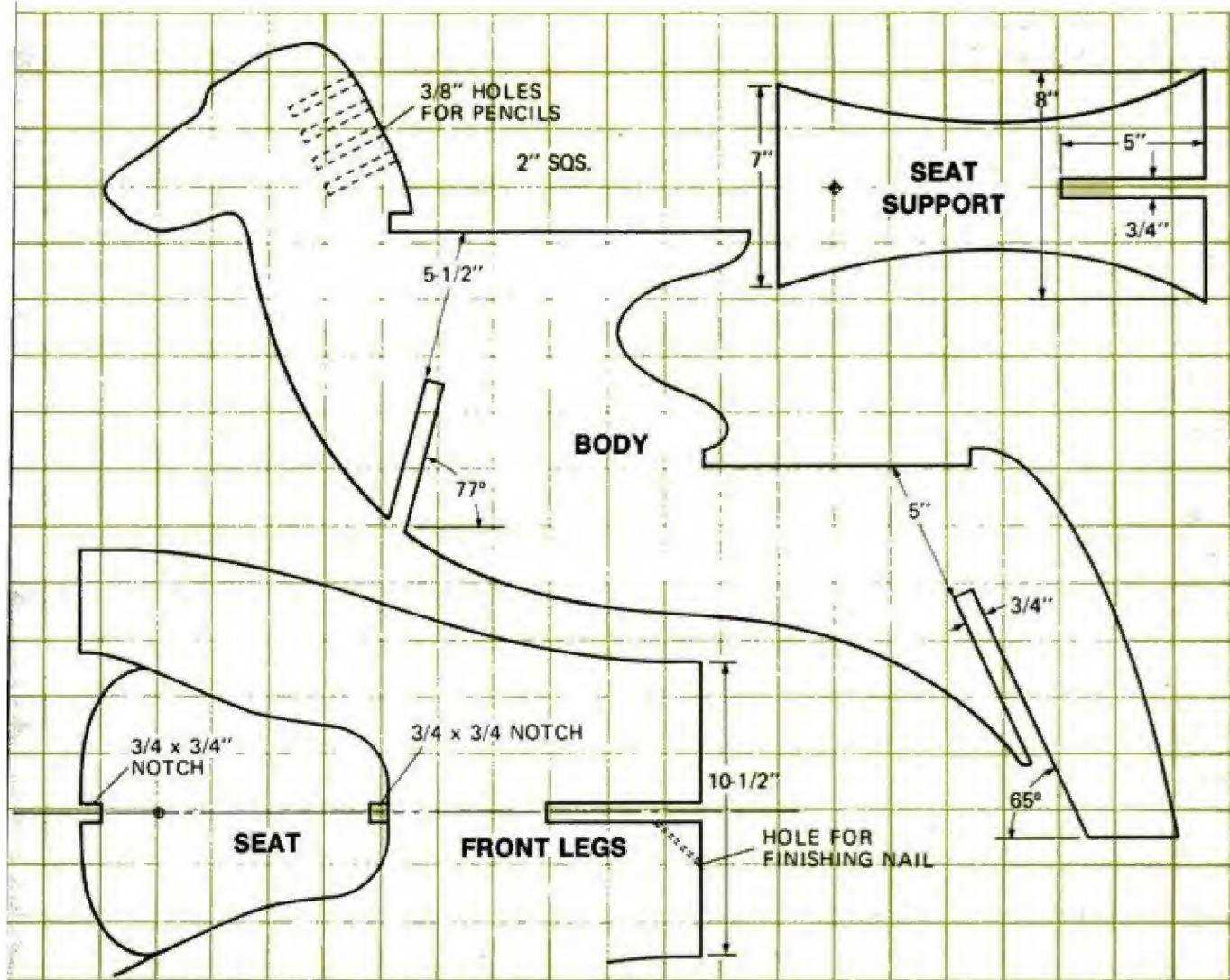
Three $2\frac{1}{4}$ -in.-long flathead wood screws fasten the seat, desktop and seat support. A long finishing nail in a $\frac{1}{8}$ -in. hole drilled at an angle holds the main body and front legs. Apply a little white glue to the notches before slipping the parts together.

Before finishing, round all sharp edges with sandpaper and fill any voids in the edges of the plywood with wood filler. Plywood finishes best if you first apply a flat-drying undercoater. Sand lightly when dry, then follow with two coats of nontoxic enamel in a bright color. ★ ★ ★



FULL PLYWOOD SHEET is reduced to workable size by clamping fence to sheet and zipping through with a portable electric saw. Sabre saw will do trick, too

POPULAR MECHANICS

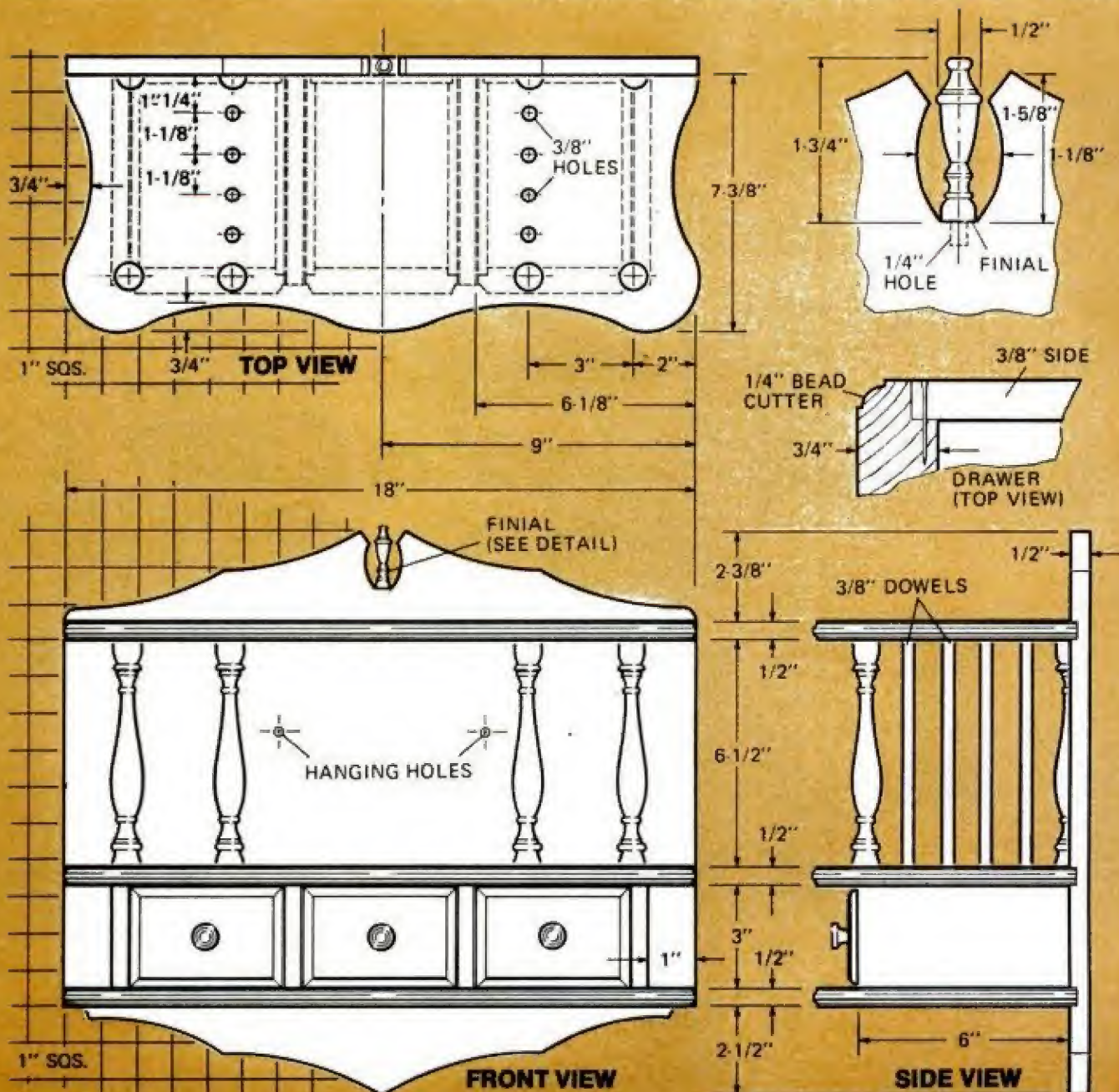


Handsome whatnot shelf

By RICHARD C. STICKLER

IF YOU ENJOY the challenge of producing a fine piece of cabinetry, you'll be eager to try your hand at making this handsome whatnot shelf with its graceful turnings and pleasing scroll-cut shelves.

The original was made of solid walnut. However, to save gluing up several pieces to cut the $15\frac{7}{8}$ x 18-in. back, walnut-faced plywood can be used. It also could be used



for making the three scroll-cut shelves.

To make the shelf, you'll need a band-saw (or sabre saw) to cut the shelves and back, a router to shape the edges a table saw to form the shelf grooves in the back and a lathe to produce the six turnings.

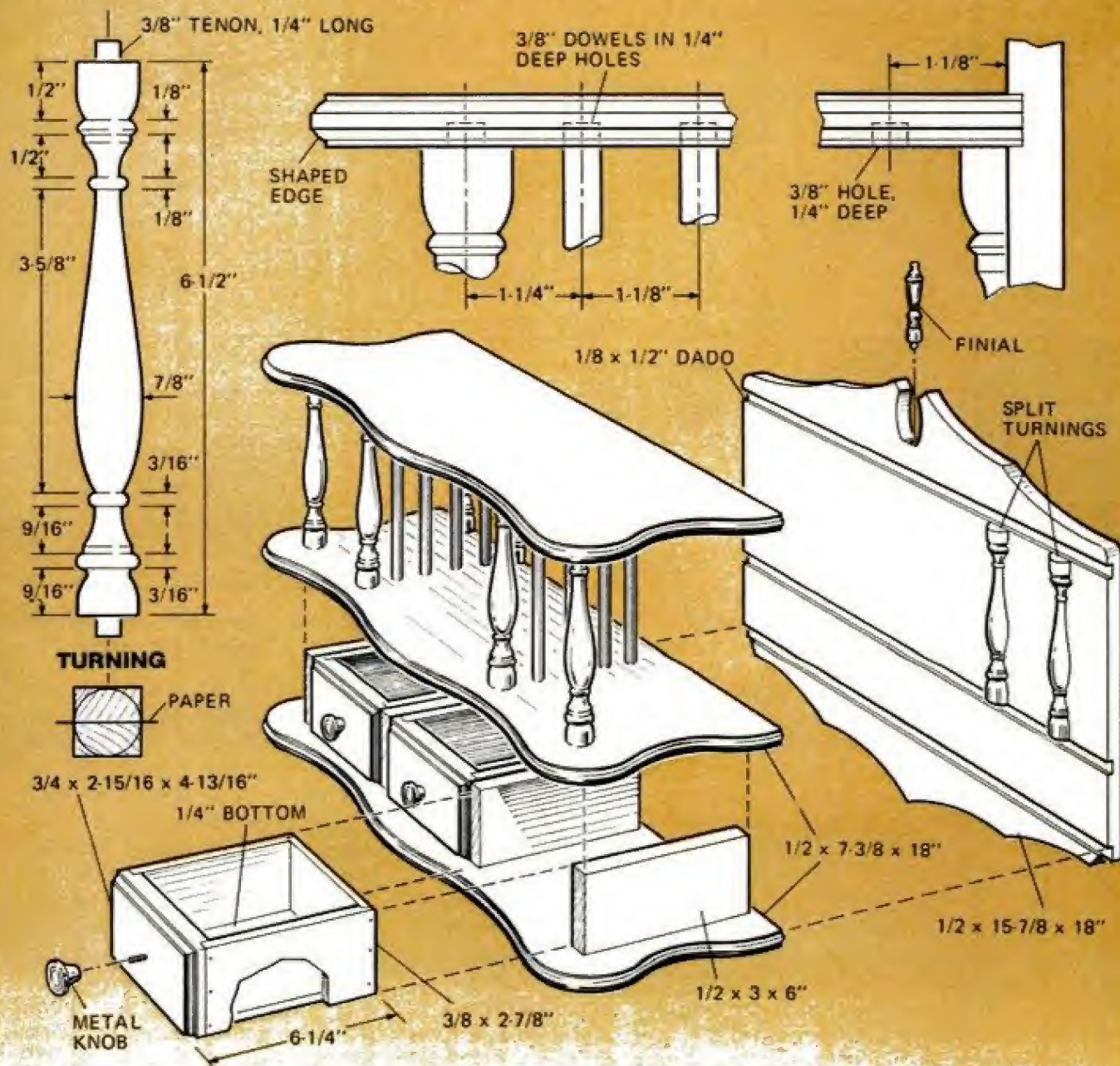
Patterns are needed for the back and shelves, but before you cut the back you must make the dadoes in it for the three shelves. The latter are identical, and the three can be bandsawed at one time. The blind holes for the turnings and dowels are identically spaced in mating surfaces with the aid of a template. All 12 holes are bored $\frac{1}{4}$ in. deep.

Two turnings make the four split ones. These are turned from blanks that consist of two pieces glued together with paper between. The paper permits the completed

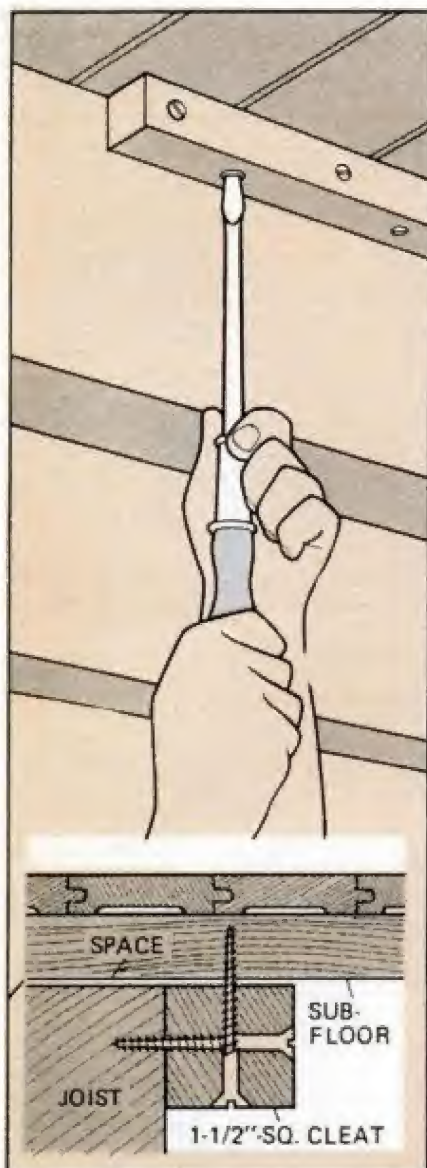
turning to be split apart neatly at the joint with a thin-bladed knife.

The drawer compartments are formed by gluing four dividers between the bottom and middle shelves. The shelves, dividers and turnings must be assembled as a single unit and then glued to the back. The four split turnings can be glued in place before or after the back section is added.

The three drawers are made to fit their respective compartments. The fronts are $\frac{3}{4}$ in. thick, the sides and backs $\frac{3}{8}$ in. and the bottoms $\frac{1}{4}$ in. A small cove is shaped around the fronts and suitable metal knobs attached. The finial can be turned of wood or brass to complement the drawer knobs. Two holes are made in the back to hang the shelf. ★★★

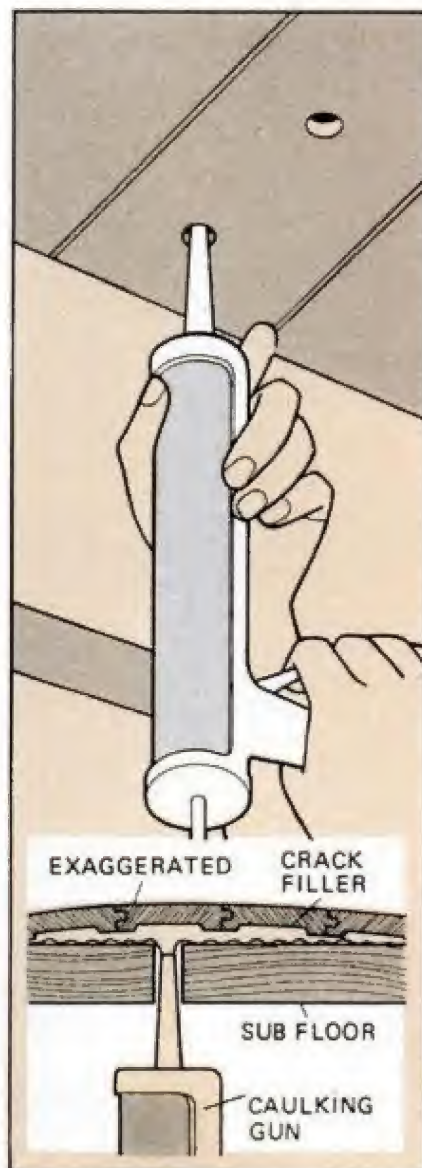


How to silence squeaky floors



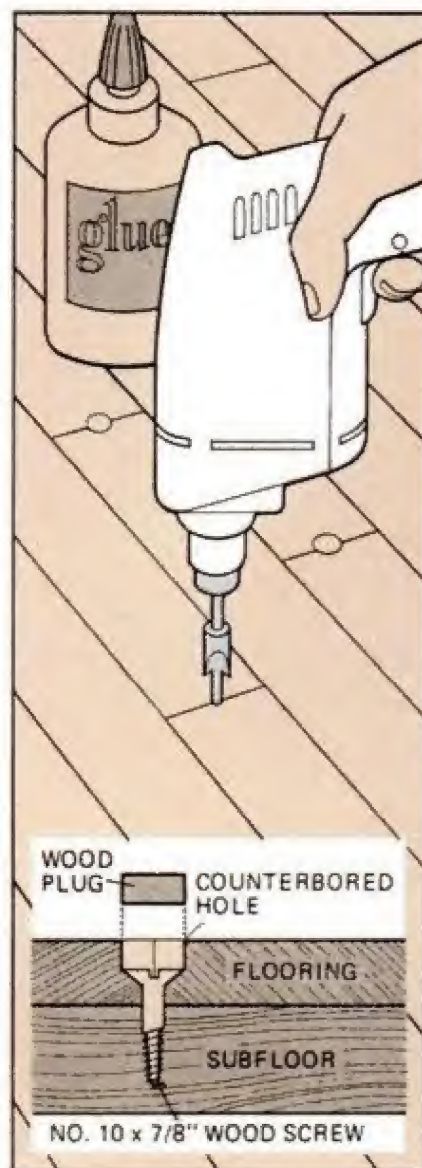
Screws and cleat will tighten loose subfloor

Floors will often squeak when the subfloor becomes loose and buckles. If a floor is accessible from the basement, the squeak can be silenced with a wood cleat. Check along floor joists near the noise; have someone walk above while you watch below. If floor is not in full contact with joists, use a cleat and screws to pull it down. Fasten cleat to the joist, even with the top edge, then drive screws up into the floor as someone stands above.



Sealant between floors will stop stubborn squeak

When swelling causes a hardwood floor to buckle slightly and toenailing it won't stop the squeak, try filling the void between floor and subfloor with silicone sealant. To do this from below, first drill a hole through subfloor only, using a twist drill instead of a spade-type bit to avoid poking through. Force the sealant into the slight space between floors by jamming the cartridge spout in the hole. Plug hole with a tight-fitting cork.

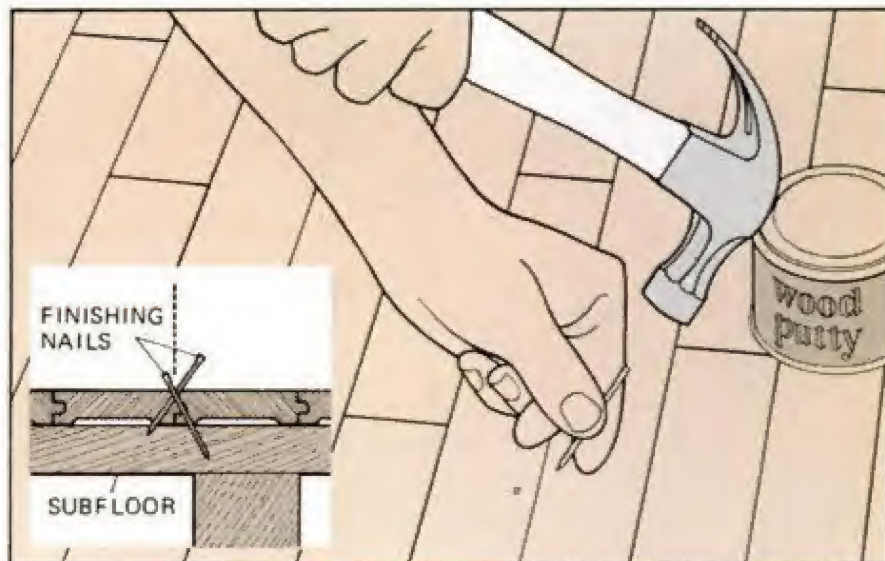


Screws in counterbored holes silence rubbing

Inadequate nailing will cause a floor to squeak as the wood dries and shrinks. When joints start to open, tongue-and-groove members can rub and make noise where they butt at ends. Here, flathead screws are better than nails to pull the flooring down tight to the subfloor. Spot holes over the end joints with a screw countersink. Drive in screws, cap with screw plugs, chisel them off flush, and touch up with stain and varnish.

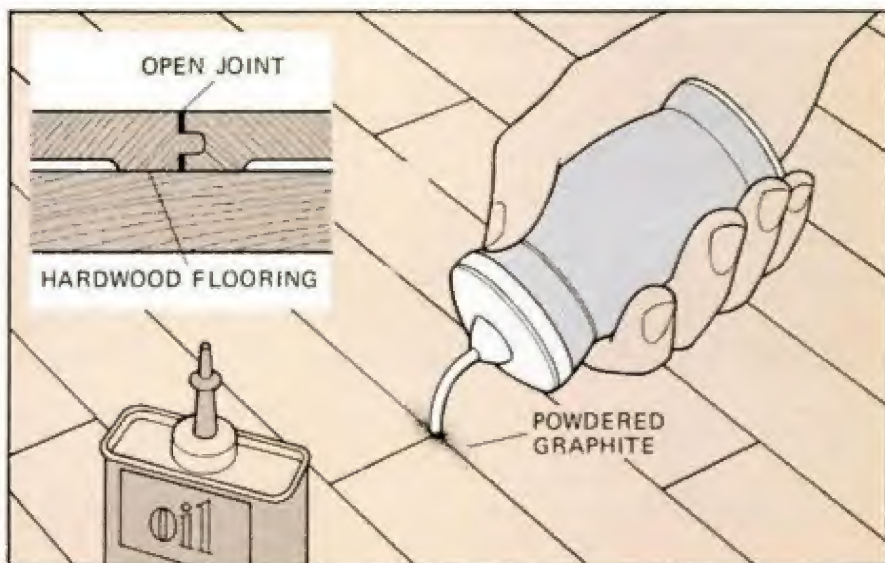
Toenailing at joints often does the trick

Annoying squeaks in hardwood floors are more likely in winter when dry furnace heat shrinks wood due to insufficient moisture. When floors can't be reached from below, surface-nailing is worth a try to silence trouble spots. Here, finishing nails are driven along flooring joints at an angle for greater holding power. Drive the nails nearly home with a hammer, then set the heads with a nailset and, finally, putty the heads.



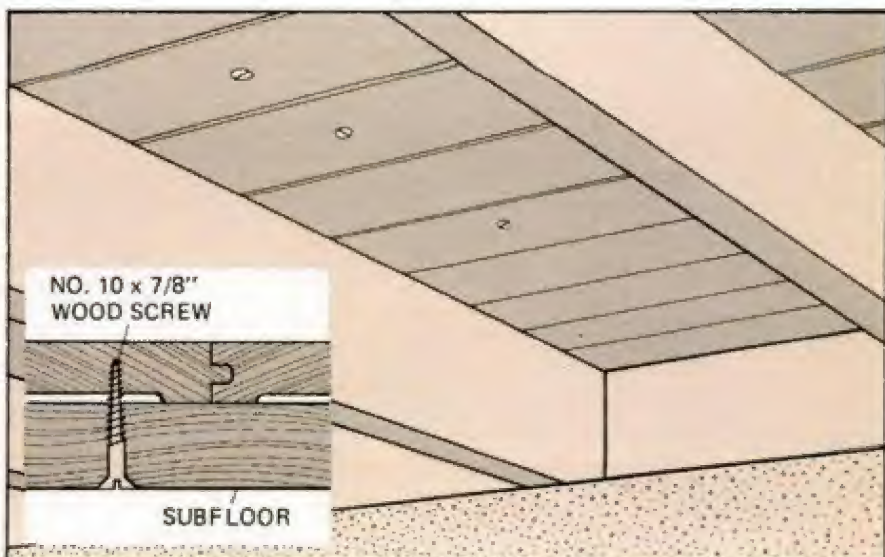
Graphite, oil lubricate rubbing floor boards

Where movement is detected along open joints, light penetrating oil and powdered graphite are effective in ending squeaks by lubricating spots where the tongue-and-groove edges rub. Oil carries the graphite into the crack. Graphite can be poured into the joint first and then the oil, or they can be mixed and flowed into the joint with an oilcan. After applying, step repeatedly on the spot to work graphite deep into the joint.



Short screws pull down 'spongy' hardwood floor

Another trick to try when you can get at a floor from below is to drive short flathead wood screws up into the hardwood floor. Drawing up on the screws pulls down loose spots firmly to the subfloor. Be careful not to bore the screw holes too far beyond subfloor thickness. To be sure, slip a wood block over the drill bit so bit protrudes no more than $\frac{3}{4}$ in. Again, someone should stand on the trouble spot while you drive the screws.



How to install and wire a yard light



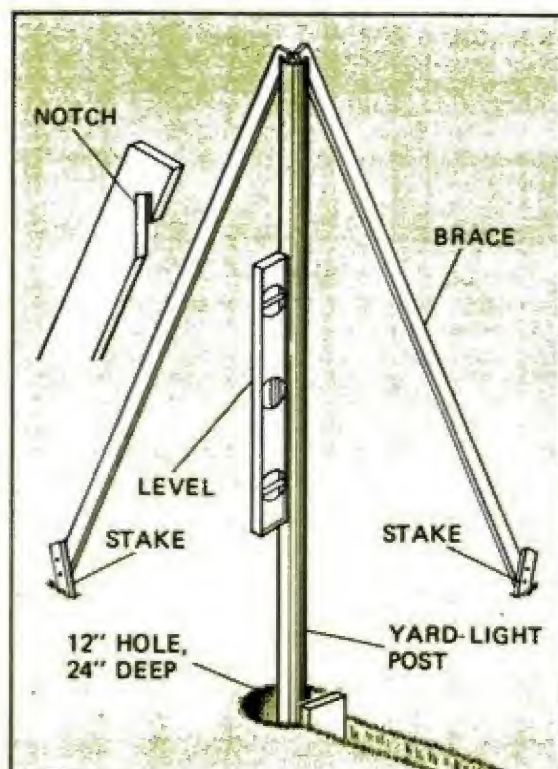
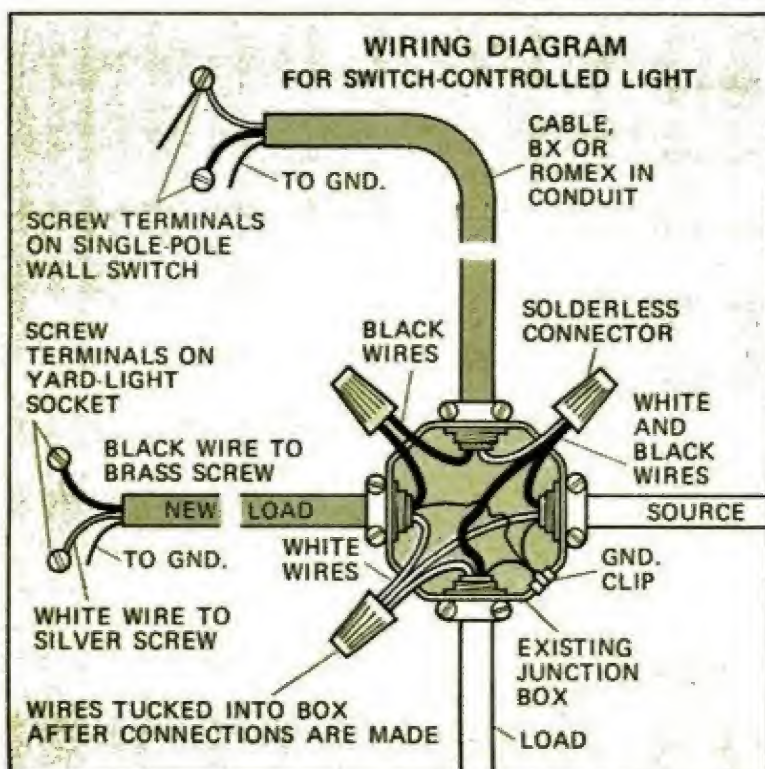
ROBERT D. HORST PHOTO

A YARD LIGHT does many things for a home. It bids welcome. It discourages prowlers. It adds nighttime beauty to the yard, and lights the way to your front door.

The biggest job in installing a yard light is digging the hole for the post and the trench for the cable. The required minimum depth is 18 in., and you'll find a narrow spade best for digging the trench.

Yard lights come with metal or wood posts, plain or fancy. The important thing when setting the post in concrete is to see that it's plumb before filling the hole. Here, in the case of a wooden post, a couple of C-clamps can be used to attach braces to it temporarily; with a metal post, notches in the braces will let you hook them over the top.

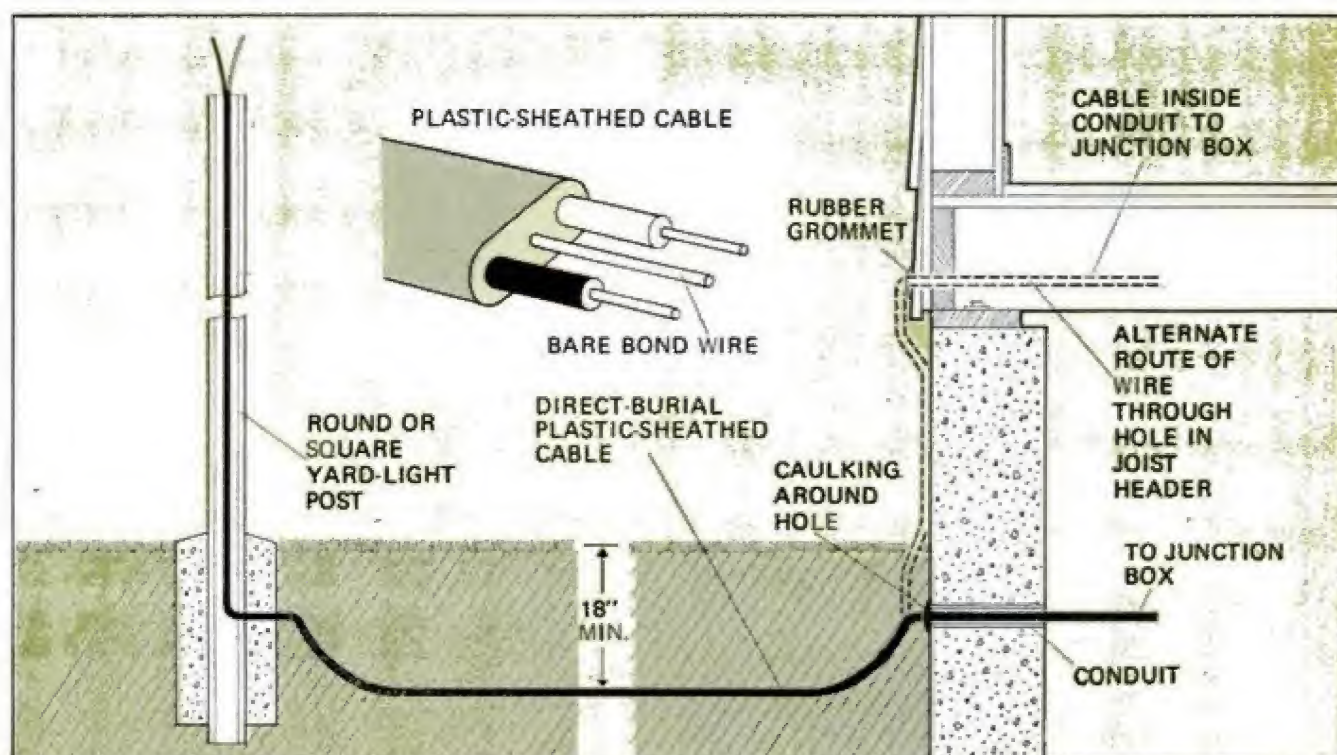
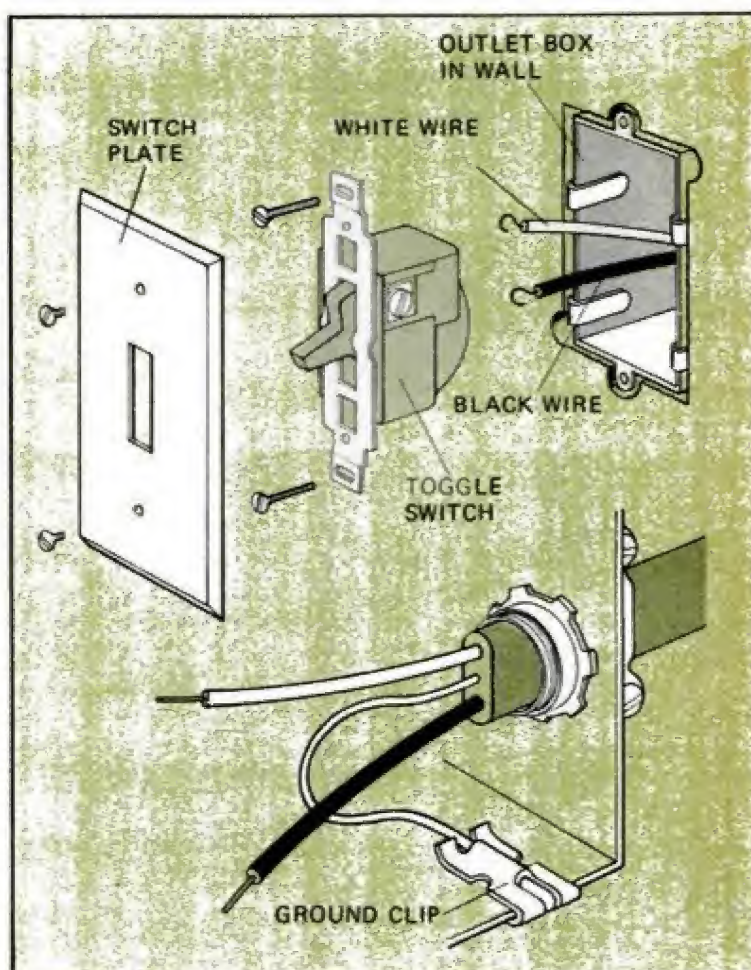
Use heavy-duty, flat, plastic-covered cable made for underground burial and run it up inside the yard-light post, leaving ample wire at the top for connecting it later to the socket. Buy three bags of dry-mix concrete to set the post, mix accord-



ing to directions and fill the hole.

To connect the cable to an existing junction box in the basement, you have to pass it through a hole in the foundation wall or a hole in the joist header. The latter is an easier job if you have a poured foundation, but it means the cable must be partially exposed. In this case, the exposed part must pass through conduit before entering the house wall.

While they cost more, you can buy yard lights that turn themselves on and off at dusk and dawn by a built-in photoelectric control. This feature eliminates the need for a separate switch. However, the drawing at right shows how to install a separate switch at some convenient location in the house, and the wiring diagram on page 100 shows how you connect the wires of the cables to the black and white wires you'll find in the junction box when you remove its cover. Turn off the electricity when making the connections, and remember to connect black wires to black and white wires to white. ★★★



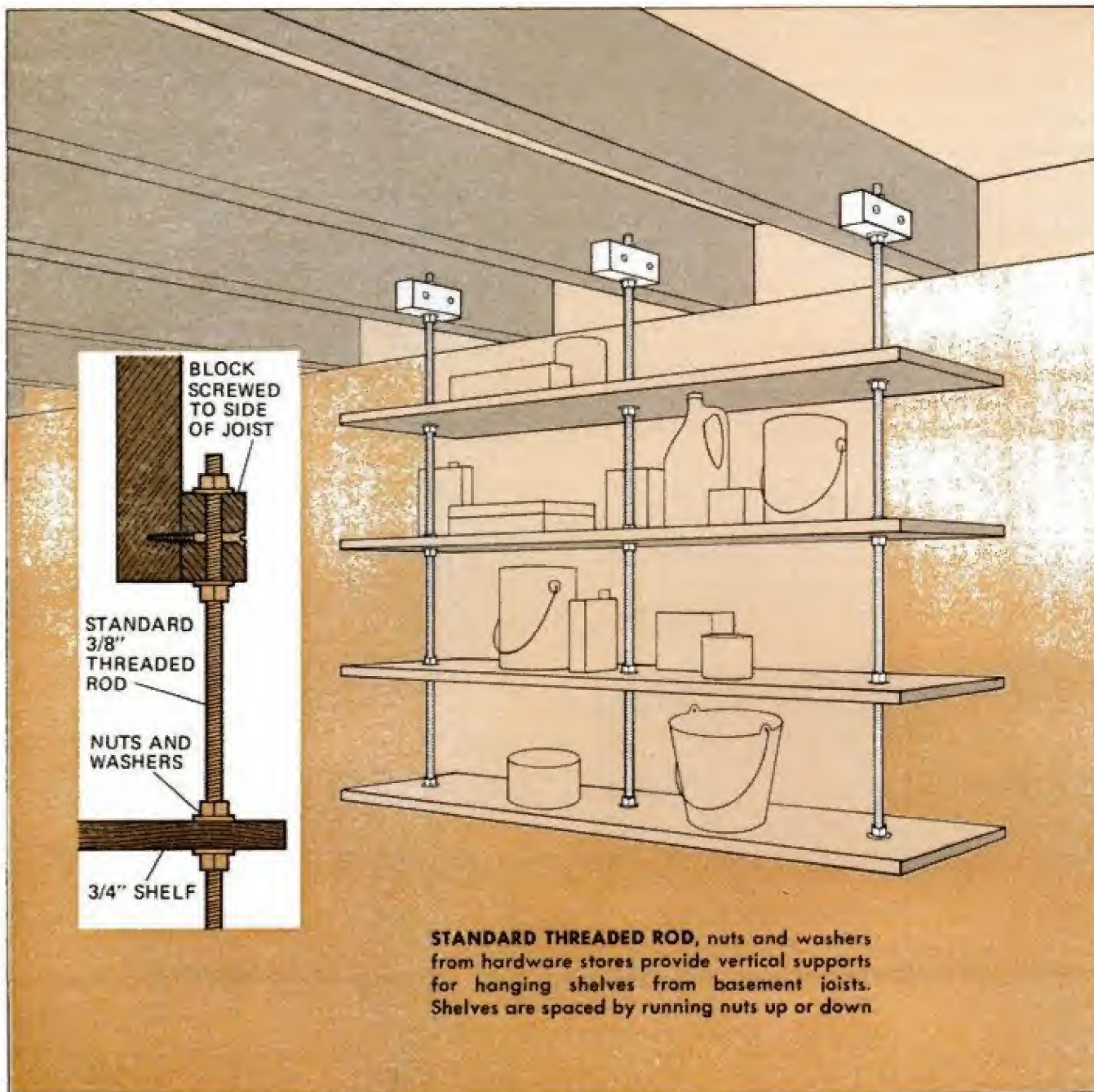
How to put up shelves that stay up

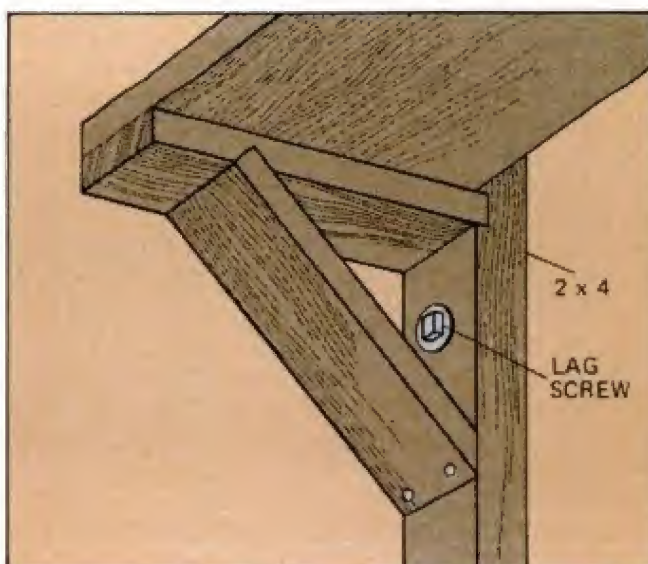
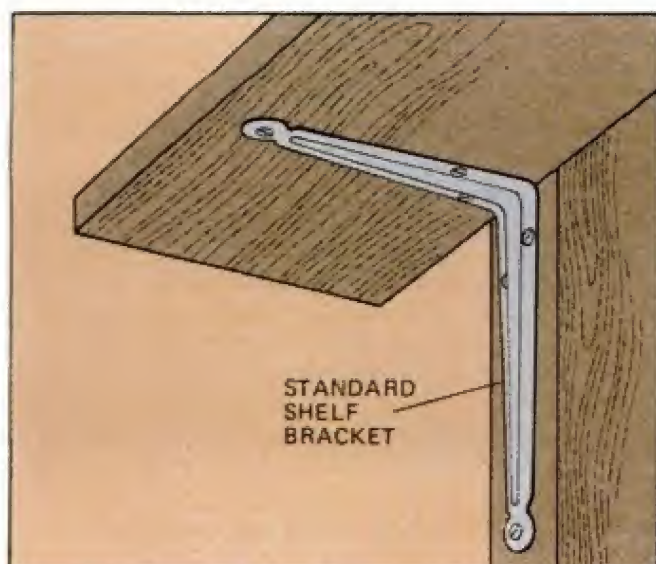
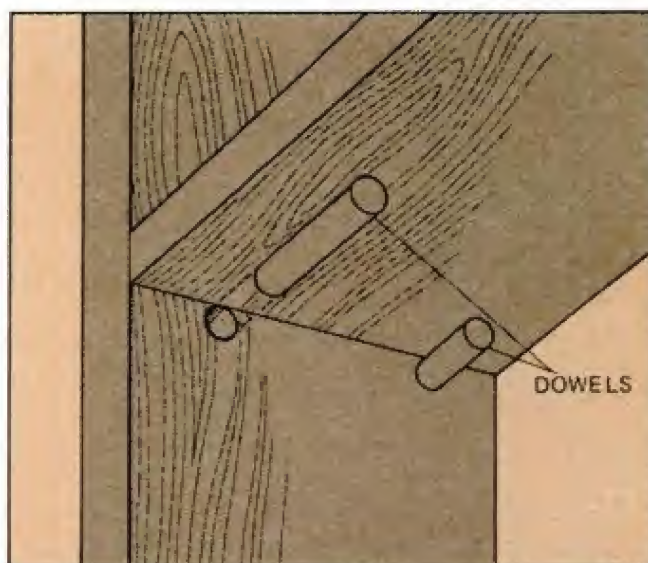
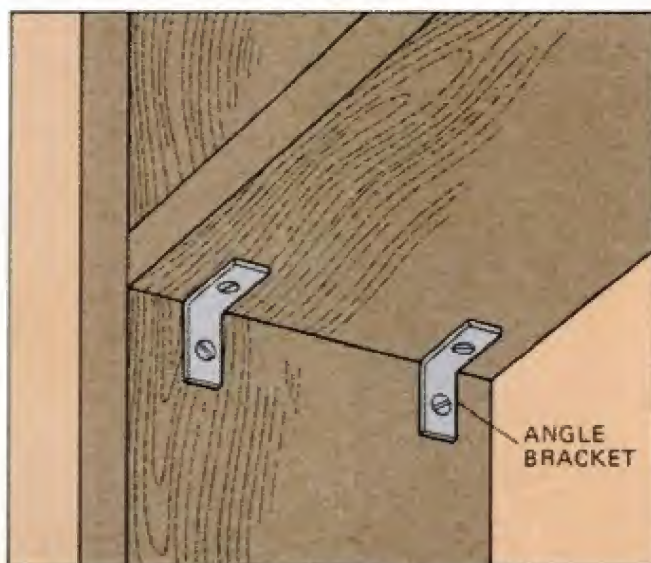
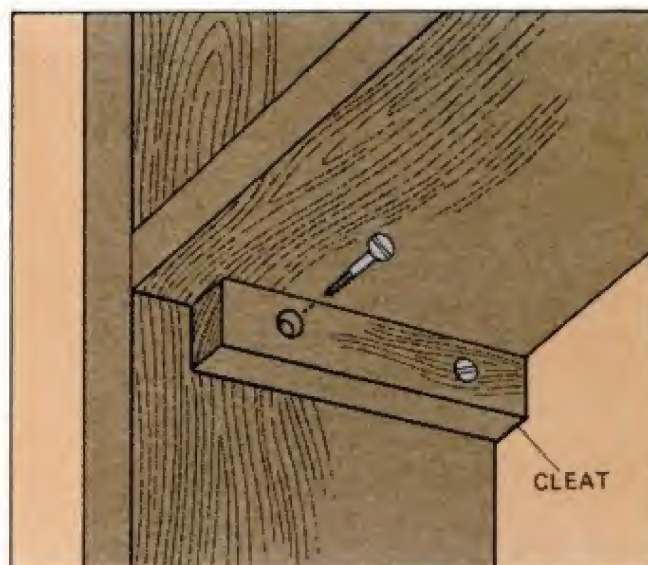
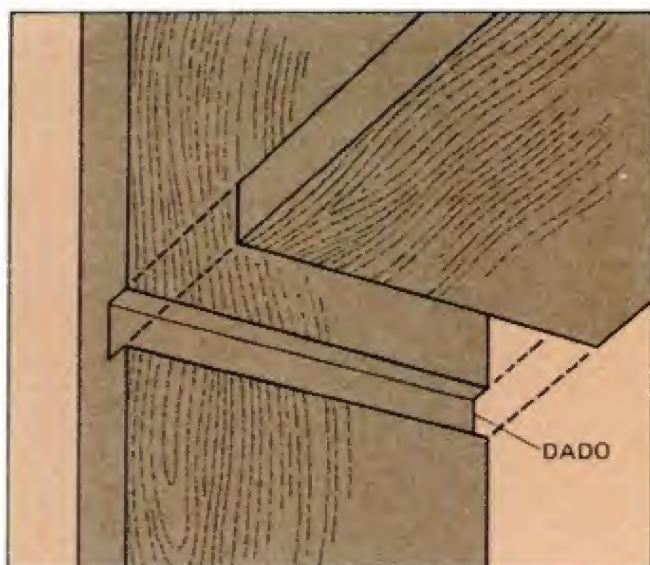
SHELVES can mean the difference between order and disorder in the basement, attic or garage, and they're something you can't have too many of for holding such things as cans of leftover paint, garden sprays and insecticides, balls, mitts and bats, clippers and shears, Christmas decorations, luggage, tools and boots.

There are about as many ways to support shelves as there are things to store. Six of

the more common ways for installing them between end uprights or fastening them to walls or studs are shown on the facing page. All methods will hold a considerable load without danger of giving way.

A novel way for hanging shelves is shown below: Two or more boards are suspended by a series of threaded rods that pass through holes in the boards and wood blocks screwed to the basement joists. ★ ★ ★

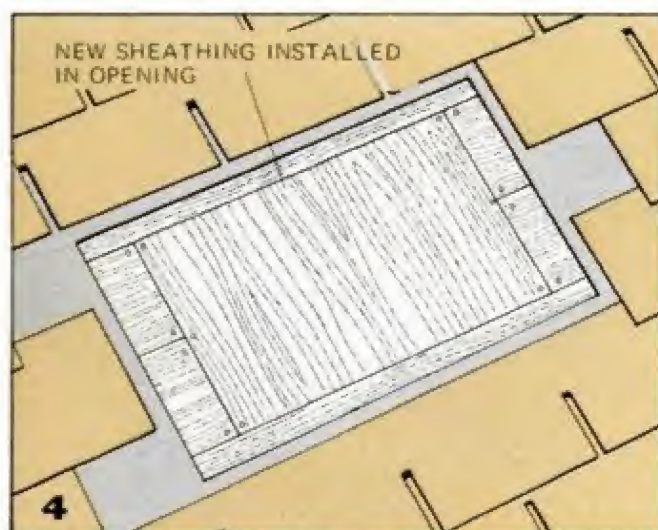




How to repair a damaged roof

HIGH WINDS and heavy rains are never welcomed by homeowners. When such storms strike, most of us consider ourselves lucky if damage to the house and property is minor. Unfortunately, very often the damage is up on the roof. Shingles that have been exposed to weather for 10 years or more are particularly susceptible to being blown off. (However, the self-seal, tab-type shingles, which have been around a while, have reduced the incidence of this type of damage considerably.) Of far greater concern is what to do when your roof—not just the shingles—has been damaged by a toppled tree or fallen limb.

If you are afraid of height and working from a ladder, don't fight the feeling: Call in a pro. But if you do the repair work yourself, be advised it is a must to thoroughly cut out all the damaged area and replace with sound material. New sheathing must be of the same thickness as the existing, and all joints must be properly covered with 15-lb. felt. Weaving-in of shingles is a must or the patched-in area will leak. ★ ★ ★



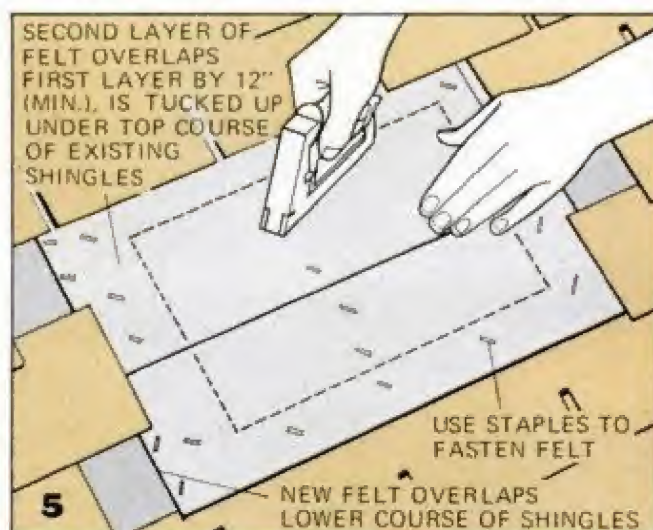
Replace the sheathing

Use either 1x6 tongue-and-groove roofers or plywood as shown, but it must be same thickness as existing sheathing. Plywood goes faster because it requires cutting just one piece (for a small hole). Next, cut 8-in.-wide felt strips and cover joints. Do bottom horizontal first, then the verticals and top horizontal; use overlaps.



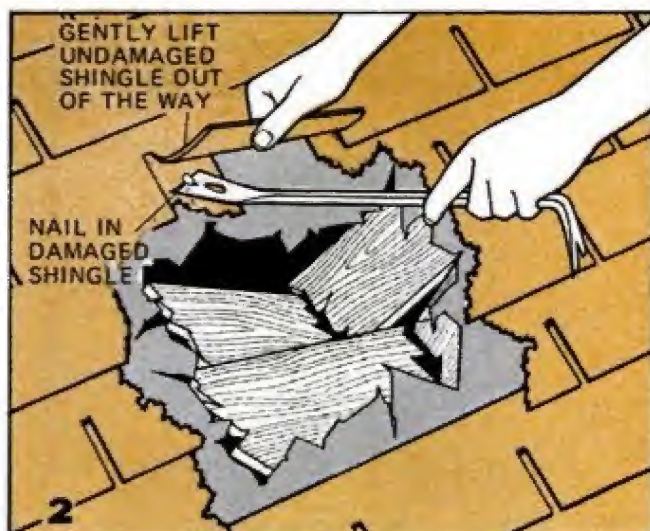
So your roof is damaged

Severe roof damage, such as shattered sheathing shown here, can be caused by falling limbs. Sheathing problems can also result from leakage, which rots sheathing. Rot damage is often not apparent. If you spot a bulge under the shingles, chances are the sheathing needs replacing. Inspect the area from inside where possible.



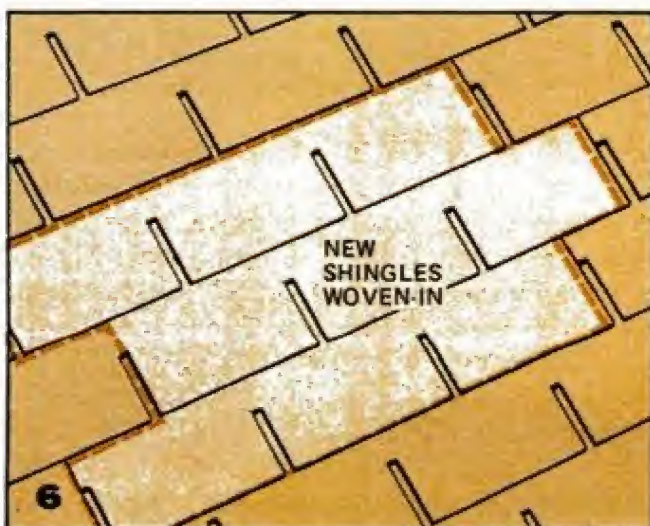
Make sure job is watertight

Apply 15-pound felt so it overlaps existing shingles on downside and is tucked under row at top. Completely cover joints discussed in Step 4 and slip felt beneath shingles to right and left. Apply felt with 12-in. overlap, making sure it's flat or shingles will bulge. Use ample number of 1/4-in. staples to secure felt.



Remove the damaged materials

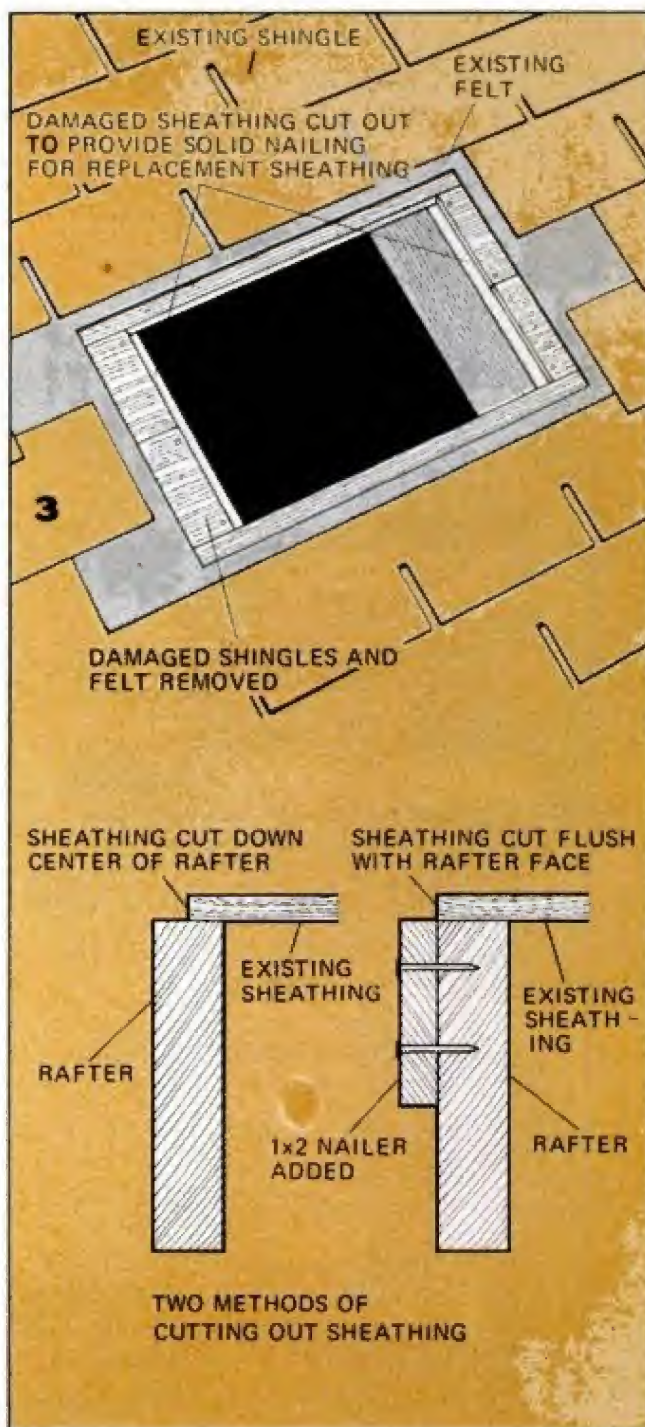
Damaged shingles and tarpaper (felt) must be entirely—and cleanly—removed. Completely remove any partially damaged shingle so you can weave in a replacement shingle. Start with top course and work down. Use a ripping bar or large screwdriver to pry up nails from damaged shingle, or tear out shingle and drive nails home.



Finally, replace the shingles

Weave new shingles into existing ones so alternate rows overlap. *Never have an unbroken vertical line (shingle joint).* Here, for clarity, new shingles are shown slightly lighter than the existing. On repair jobs, take a piece of old shingle when you buy the new. Try to match so your repair job will be virtually invisible.

MAY 1973



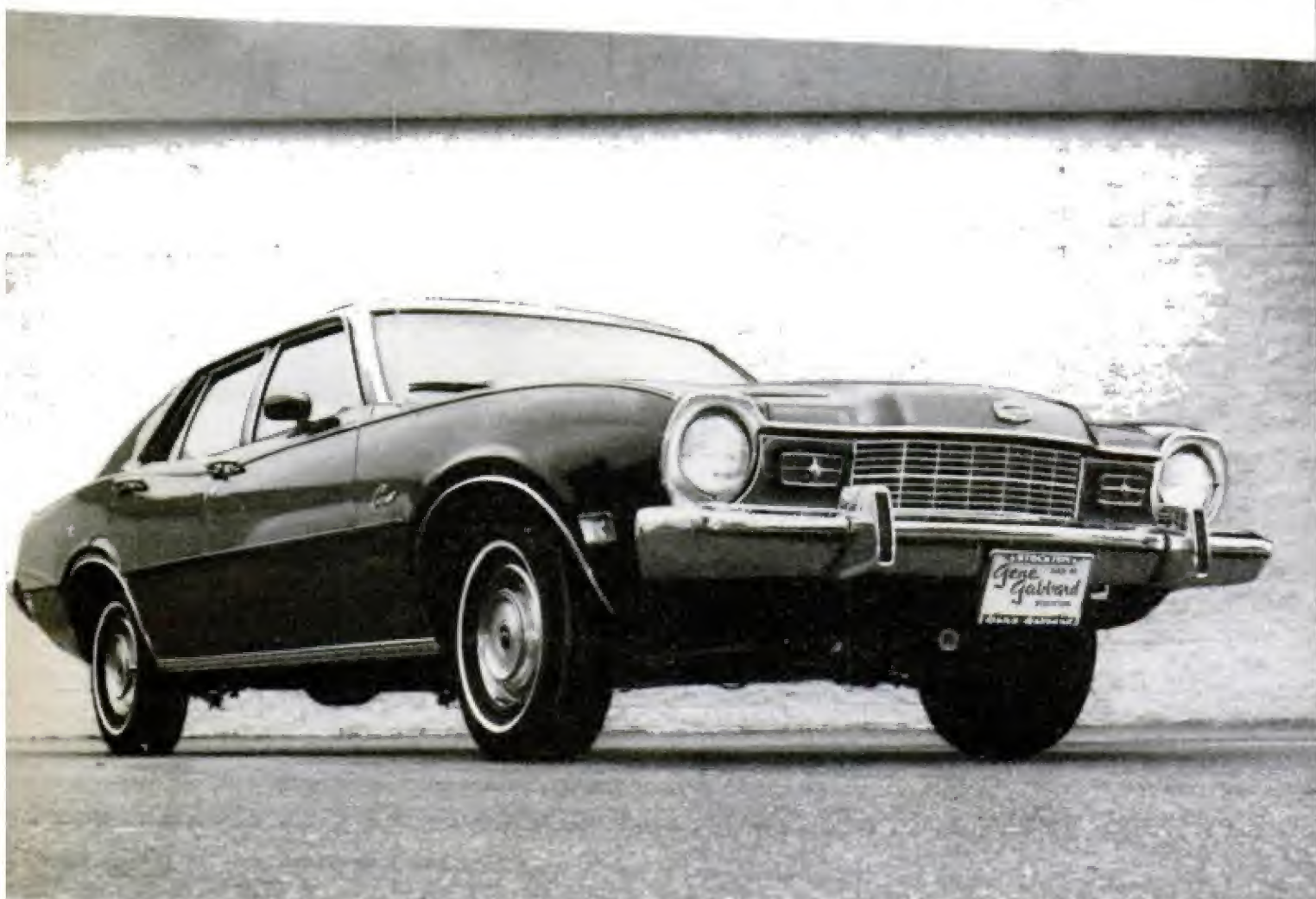
Create a clean hole

Next, remove all damaged, split and cracked sheathing to obtain a squared, easy-to-fit opening. You need solid nailing to attach new sheathing; use either method above to cut out old. Either cut down center of a rafter or cut alongside and add a 1x2 nailer for the new sheathing to be fastened to. The latter method is easier.

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PM OWNERS REPORT: MERCURY COMET

Handles beautifully . . .



By **MICHAEL LAMM**
West Coast Editor

Photos by the author

THE COMPACT MAVERICK was introduced by Ford in 1969, and two years later Mercury offered its own version under the Comet nameplate. Both these cars share identical body shells and running gear. Model for model, the Comet's prices run about \$50 higher than the Maverick's.

Two-door Comets and Mavericks span a 103-inch wheelbase, while four-doors are on the 110-inch chassis. Both use unit construction, and the Comet stretches about two inches longer overall than the Maverick. Mavericks also weigh about 100 pounds less. Major differences, then, center on trim.

Most Comet owners (84 percent) chose the 302-c.i.d. V8, preferring it to either of the Sixes available.

The heavier V8 apparently contributes to two nagging problems: lower than-expected gas mileage and higher-than-expected brake pedal pressures.

Poor gas mileage was cited by 27.8 percent of our sampling, most of them V8 owners. Many blamed it on the Comet's smog system. "Besides getting lousy mile-

A nationwide survey based on 839,000 owner-driven miles

except at the gas pumps!



SIZE AND STYLE sold most owners on the Comet, with handling and parking ease garnering much praise. The four-door has seven inches more legroom than the coupe, thus more rear legroom. Comet shares unit body, engines and running gear with Ford's Maverick; some owners feel they are too much alike—prefer more distinctive styling. Dashboard lacks glovebox, has only a parcel tray. Some drivers complained that mirror obstructs vision ahead. Non-availability of disc brakes and power assist disappointed safety-minded owners

age," snorted a West Virginia gas station owner, "the engine hesitates on takeoff. My dealer could not correct this and explained that it's caused by the antipollution device and that it is unlawful to correct it. He has done everything as to tuning and such, but it doesn't help. I cannot take a chance on entering a busy highway in traffic and have to wait for a long opening. Which would be worse—dying someday from pollution or dying now in a traffic accident? I know I'm not alone with this problem."

As for brakes, the larger engines (250-c.i.d. Six and 302 V8) seem to leave the 10-inch drums gasping and the driver's leg muscles likewise. A Syracuse, N.Y., office manager sums up several owners' feelings this way: "Braking with drums not satisfactory due to engine size." And a Dearborn schoolteacher writes, "Power brakes are a must, because the present brakes require so much strength from my leg and foot that I often shift into neutral at stop lights." Trouble is, neither power assist nor disc brakes are available in



BIG ENGINE, the 302-cu.-in. V8, is most popular with owners. It averages 3-4 fewer mpg than 250-c.i.d. Six. Bigger trunk would be welcome; several owners suggest making hatchback and station wagon available

Comets. Maverick and Comet increased brake-drum diameter from 9 to 10 inches on their smallest 200-c.i.d. Sixes. Those 10-inchers are the same drums that the 250-c.i.d. Six and 302 V8 had all along, and they still have them.

Size and styling were major factors in determining initial purchase. "I saw it, looked it over, and loved it," exclaims a Dayton, Ohio, telephone operator. She reports, "Compact size along with room for five make this my kind of car."

"I needed another car in a hurry," writes a Massachusetts engineer, "and the Comet had what my teenagers wanted.

It's a good-looking car." A Michigan machinist: "All things considered, and I have owned quite a few cars of various sizes and makes, I find the Comet solidly built. It rides well, is quiet, and we are more pleased with it than with others we have owned."

Several owners complained about the Comet's similarity to the Maverick, especially in appearance. They'd like to see front and rear styling treatments made more distinctive. A few also suggested offering a hatchback and/or a station wagon—something between Montego and Pinto.

Another item high on the would-like-



MANEUVERABILITY matches roadholding, which is good at highway speeds and little affected by crosswinds

Summary of 1973 Mercury Comet Owners Reports*

Total miles driven 839,981	Styling 29.2	Yes 1.9
Average miles per gallon:	Comfort 26.4	Dealer repairs satisfactory?
200-cu.-in. Six (sample too small)	Economy 21.8	Yes 62.2%
250-cu.-in. Six: local driving 15.2	Good ride 19.0	No 37.8
long trips 19.6	Right size 13.9	
302-cu.-in. V8: local driving 12.5	Specific dislikes:	Dealer service opinion:
long trips 15.5	Poor gas mileage 27.8%	Good to excellent 45.7%
	Brakes 8.5	Average to poor 54.3
	Lack of glovebox 7.6	
	Antipollution devices 5.4	Workmanship opinion:
Engines:		Good to excellent 64.8%
200-cu.-in. Six 0.4%	What changes would you like?	Average to poor 35.2
250-cu.-in. Six 15.6	Add a glovebox 19.1%	
304-cu.-in. V8 84.0	Better gas mileage 9.0	Is the Comet your only car?
	Bigger trunk 8.5	No 52.7%
Transmissions:	Better rear visibility 7.5	Yes 47.3
Automatic 98.7%	Better brakes 7.0	
Manual three-speed 1.3		Other cars owned:
Body styles:	Had any mechanical trouble?	Ford 24.6%
Two-door sedan 64.3%	No 55.1%	Mercury 21.4
Four-door sedan 35.2	Yes 44.9	Chevrolet 15.9
		A second Comet 6.3
Why did you buy a Comet?	What type of trouble?	Age distribution of owners:
Size 29.2%	Carburetor problems 28.6%	15-29 years 32.8%
Style 28.3	Transmission 10.5	30-49 years 31.1
Economy 22.3	Brakes 10.5	50-plus 36.1
Past experience 18.9	Power steering 8.6	
Price 10.3		Would you buy another Comet?
Specific likes:	Did you repair it yourself?	Yes 68.8%
Handling 54.6%	No 98.1%	No 31.3

*Percentages might not equal 100% due to rounding or insufficient data.

to-see list was a glove compartment instead of the parcel shelf under the dash. At this writing, there's not even an optional glovebox.

Handling came in for high praise under our *specific likes* query. "Easy to handle in traffic, and I appreciate this since I do much traveling in my job as pastor of a church," states a New Mexico clergyman. "Turns very sharp," says an Indiana mill operator. "I like the response."—Detroit carpenter. "Good stability on the highway."—Michigan newspaperman.

General comfort also got good marks. "I'm over six-foot-three, 250 pounds, and I have plenty of room," crows a Mississippi student. "Front very comfortable, rear too cramped," says an Iowa construction engineer and owner of a two-door. The four-door has about six inches' more legroom in back and didn't come in for very many complaints from the passengers.

Comet GT owners praised its bucket seats, and most people were in agreement that the Comet's ride is smooth, although some are of the opinion that the car could be better insulated against road and engine noise.

Workmanship got good marks, with nearly 65 percent rating it *good to excellent*. An Iowa secretary: "So far the quality of workmanship has been fine. My

only complaint is that the paint chips easily. Maybe they could put on one more coat." A Chicago office clerk: "Great—just like a little luxury car." A St. Louis watchman: "Solid high quality." And an Indianapolis parts manager: "I feel I have gotten what I paid for."

Suggestions from owners to the manufacturer include these "Make power disc brakes available if not standard equipment." "Change the bumper so you can jack the car up from the front and back instead of from the sides." "Better gas mileage." "I would like a glove compartment like other cars have." "Bigger trunk." "A wing vent in the front windows." "Ashtrays in the rear." "Front-seat belt buckle lengthened." "The hood should stay up without a prop rod."

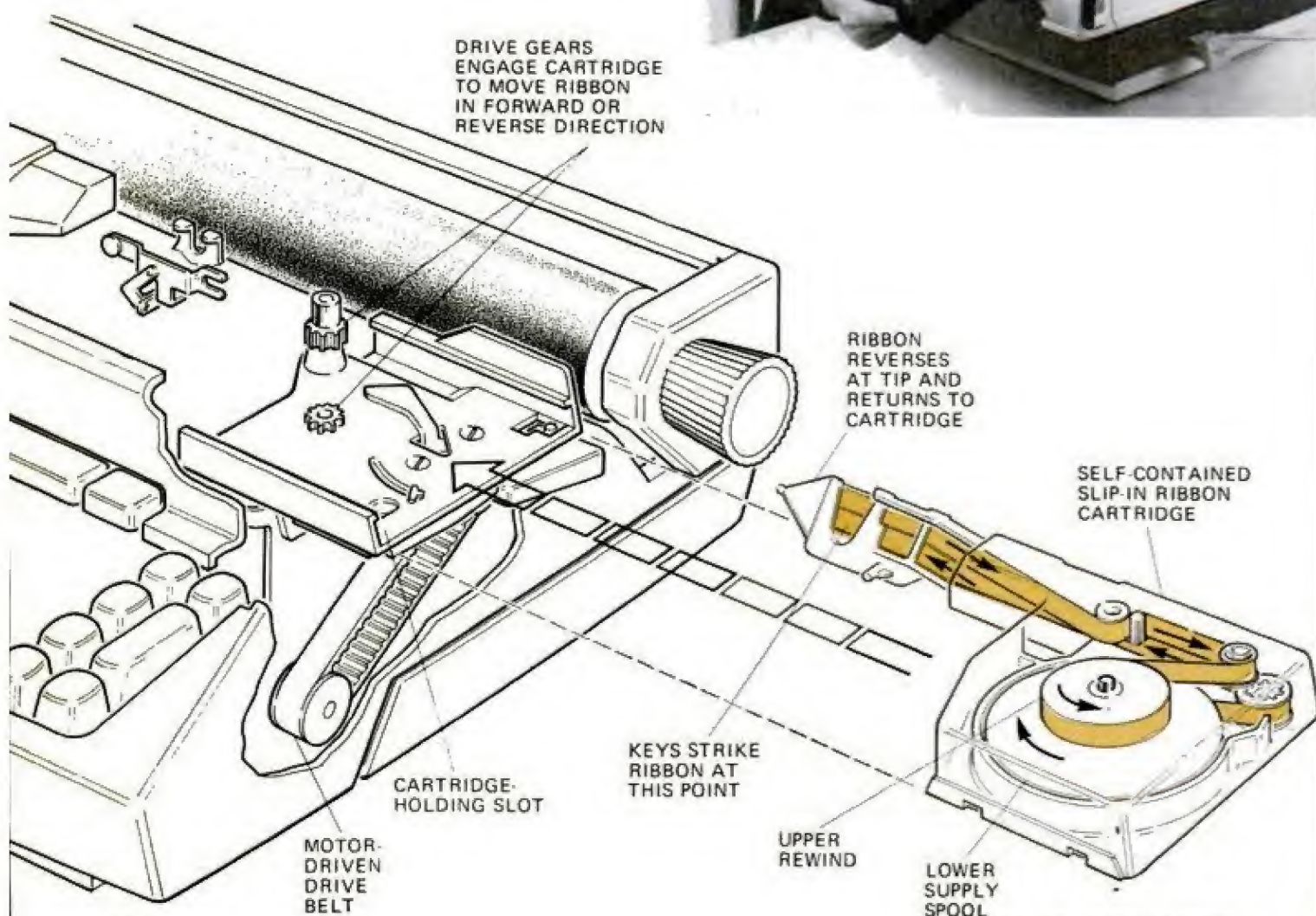
Comet owners were amazingly evenly divided in age. Usually a car will appeal more to, say, young people (ponycars, for instance) or to older ones (luxury models), but the Comet attracted all age groups. Among them, 31.3 percent said they probably wouldn't buy a Comet their next time around, but that's because they expect their family size or personal economics to change. It didn't reflect their opinion of the car. Most were well satisfied with the Comet, and praises were predominant in the majority of owner responses.

★★★

IT'S NEW NOW

First cartridge-loading electric typewriter: No more messy ribbon changing

They've finally licked the messy job of changing typewriter ribbons. In Smith-Corona's new Coronamatic electric typewriter, you simply slip in a self-contained cartridge, and a motor-driven mechanism does the rest. The ribbon automatically unwinds from a supply spool and rewinds back onto a take-up spool as you type—like tape in a recording cartridge or film in a movie camera. The cartridges take only three seconds to change, come in red, black, blue and green for fast color switching, and even include a special type you insert for quick erasures. About \$330. SCM Corp., 299 Park Ave., New York, N.Y. 10017.



THE LATEST PRODUCTS AND DEVELOPMENTS

Those were the days: Famous warplanes go on show in Britain's first RAF museum

Nostalgic memories of old-time aerial warfare come to life in Britain's new RAF Museum, the country's first to be devoted exclusively to aviation history. At top below, one of the last of the mighty Lancaster bombers, this one credited with more than 125 missions over Germany in World War II. At center, an ancient biwing Hawker Hind. General view at bottom shows other early relics dating back to World War I days.



Pretty way to stop a train

You don't need a pretty girl to stop a freight train—but it helps. Anyhow, what the blond lovely above is demonstrating is a new portable wheel chock designed to keep runaway freight cars from rolling loose accidentally. Made by Federal Sign & Signal Corp., it's simply hooked over a rail and locked in place by lowering a weighted arm.

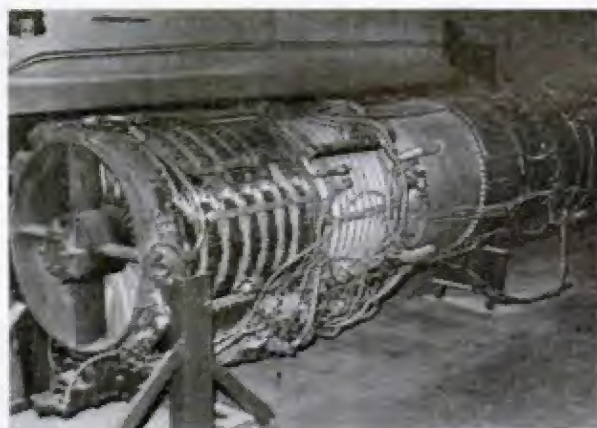


No, no, officer—don't shoot!

If a highway trooper points a gunlike object at you, don't worry—he isn't going to shoot. He's just clocking your speed with a small, hand-held radar device, being tested by Los Angeles police to replace more cumbersome roadside setups.

World's fastest speedboat won't touch the water at all—it 'flies'

Whether this is the world's fastest speedboat or the lowest-flying jet is a matter of question. Called the U.S. Discovery, the 38-foot-long needle-nosed hull is currently under construction by water-speed record-holder Lee Taylor at Cerritos Industrial Park in California. Shown in model form at upper right, it will be powered by a GE J-79 jet engine (lower photo, far right), developing 17,800 pounds of thrust. Once up to speed, the missile-like craft will actually become airborne, skimming the surface on a cushion of air a few inches above the water. Taylor eventually expects to reach a speed of 840 mph—nearly three times the present water-speed record of 285 mph and more than 200 mph faster than the land-speed record of 622 mph. Included in the design is an airplane-type ejection seat for emergency escape in the event of trouble—a feature Taylor hopes not to have to use. Next stop: a 2000-mph version.

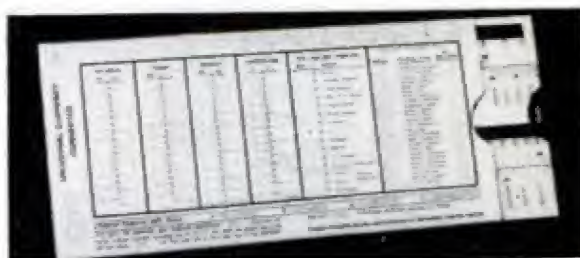


Tennis anyone—table style?

You don't need an expensive clay court to play tennis with this twin-table setup, said to provide the fun and action of regular tennis at minimum cost and space. Called "Double-Up," it consists of two 6 by 12-foot tables with a horizontal net between them. The object is to get the ball back and forth from one table to the other without its falling into the net. The game, played indoors or out, follows standard tennis rules. \$485, with balls and rackets. Double-Up Co., 420 Lexington Ave., New York, N.Y.

Confused about foreign money and the metric system? These simple calculators do the figuring for you

With today's rapidly increasing interest in world travel and imported products, these two handy new slide-rule-type calculators will help you convert U.S. money and units of measure into those of foreign countries. One at top right changes American currency into any foreign equivalent. Unicon is \$3.95 from PJS Enterprises, 1 News Plaza, Peoria, Ill. 61601. One at bottom converts U.S. weights and measures to European metric system. Union Carbide Corp., 270 Park Ave., New York, N.Y. 10017, sells it for \$2.50.



Bombs won't jump through this hoop

This new hooplike metal detector may put an end to letter bombs used by terrorists to send explosives in the mails. Placed over a letter or small parcel, it's so sensitive it will spot objects as small as the head of a pin inside. The portable instrument detects ferrous and nonferrous metals and sounds warning tones from a high-pitched whine to a low buzz depending on the amount present. Invented by John Adams of Croydon, England, it's being tried by British airlines and post offices.

MAY 1973

It's a plane, it's a car—it's both

Most flying cars look like just that—cars with a pair of wings stuck on. But not this trim little roadable autplane built by Dewey Bryan of Highland, Mich. Designed primarily as an airplane, it can still travel highways under its own power, carries Michigan license plates as proof. Wings fold for road use, and pusher prop—safety shrouded—provides propulsion both in the air and on the ground.





Roadside system issues fog warnings automatically

The long-nosed robot at lower right above senses fog in California's San Joaquin Valley. When fog gets thick, it turns on a warning sign up the road (top photo). The electronically controlled signs can also be changed by telephone to warn of accidents (lower left). Lear Siegler makes the fog sensor, Display Technology Corp. of Cupertino, Calif., the signs.

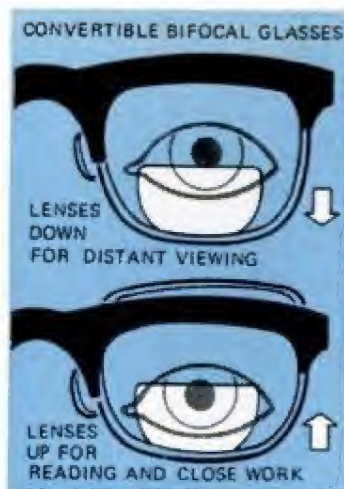


Sailing four ways

This convertible, lightweight Honker sailer goes faster than the wind on land, water, ice or snow. Prices start at \$299. For information, write Honker Landsailors Corp., 817 West 17th St., Costa Mesa, Calif.

POPULAR MECHANICS

Material: aluminum alloy, stainless steel, plastic

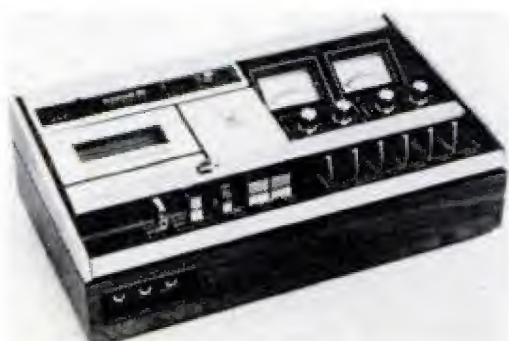


Elevator eyeglass frames

Bifocal wearers know that the head-tilting required for sight through different lens segments can cause a literal pain in the neck. Frames that let the wearer raise and lower lenses solve the problem, according to the inventor—optician Alan A. Masucci—who says his design is first to give proper lens angle automatically as well. Frames are marketed through Vista Optical Corp., Pine Hill, N.Y.

Two tape recorders with new tricks up their circuits

Designed to overcome problems of 8-track cartridge recording, 3M's Wollensak record/playback deck at top below has an elapsed-time counter so you don't get caught in the middle of a track change. Other features include fast forward, dual VU meters and a cueing device that automatically starts you at beginning of a track. About \$160. Bottom unit, also by Wollensak, is a Dolby cassette recorder that permits direct playing of Dolbyized FM-stereo broadcasts from a tuner without additional equipment. About \$300.



Stove guard keeps pans from tipping over, helps prevent burns from boiling liquids

Children have a dangerous knack of tipping pans full of boiling liquids off stove tops and on to themselves—and so do many adults. The British-made stove guard shown below prevents accidents by making pots untippable (and harder for little hands to reach). The adjustable guard, made by Fisher Segal Ltd., is offered in white enamel and stainless steel finishes. The device has been recommended by the British Safety Council. Prices start (over there) at about \$12.



NOW



Scissors cut more, fray less

Better at cutting patterns without fraying edges, according to the manufacturer, is new electric scissors from Wen Products, Inc., 5810 Northwest Highway, Chicago, Ill. 60631. At \$7.95, Model 22 boasts two-speed switch, hand-fitting contours, heavy-duty capabilities.

New tools offer one-hand starting for small screws in tight spots

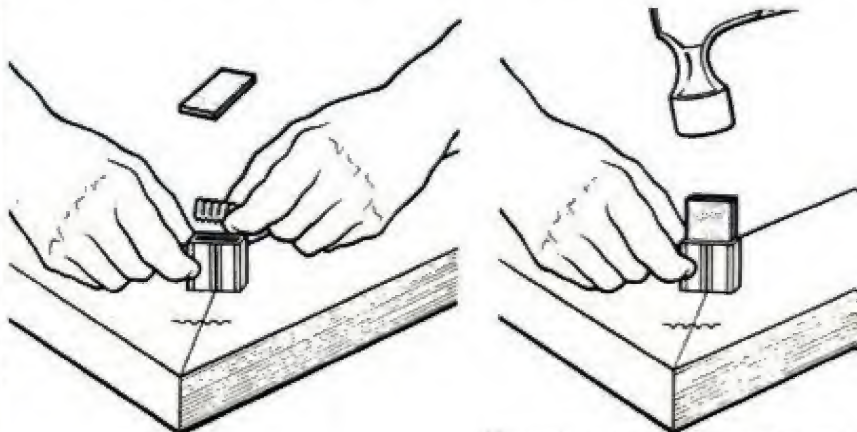
Starting tools for slotted and Phillips-head screws are offered by Kastar, Inc., Station Rd., Bellport, N.Y. 11713. Each grips screw firmly, is pulled away when screw is ready for tightening with a regular screwdriver. They're recommended for use with small screws and when working with one hand in hard-to-reach places. \$2.89 for slotted-head starter, \$4.25 for Phillips-head type.



Sure-Set lines 'em up, sets 'em down flush

Corrugated fasteners go in straight and flush with Sure-Set. Drop a fastener into the sleeve, drop the set in after it and hammer until alignment of a mark on the set with top of sleeve

shows that the corrugated nail is flush. Marks on sleeve make it easy to align with joint line. From Stanley Tools, New Britain, Conn. 06050, tool is 99 cents at hardware stores.





Hook-on handle for paint cans

Snap-on Grip-Saf-'n'-Pour paint-can handle permits one-hand pouring, is more comfortable to carry than usual wire handle. Maker claims device can "handle" up to 30 lbs. For availability, check your local paint store or write Amatco-Automatic Machine & Tool Co., 8852-C Robin Dr., Des Plaines, Ill. 60016.

Game puts you in left-hand seat

You are captain of a fleet of 747s when you play Flight Captain. You try to beat other fleets in an around-the-world race using well-known airlines, airports. Game for two to four players is \$4; E. S. Lowe Co., 200 Fifth Ave., New York, N.Y. 10010.



Beefy grass shear is cordless

Heavy-duty, cordless electric grass shear from Disston sports blades 4 in. wide, comes with overnight charger. Yard-tool line also includes upright grass shear and two hedge trimmers. For prices, write Disston, Inc., 601 Grant St., Pittsburgh, Pa. 15219.

Benders for small tubing

Tube-bender sets usually go no smaller than $\frac{1}{4}$ -in. o.d. tubing. This set lets you put kinkless curves in copper, brass and aluminum tubing from $\frac{1}{16}$ to $\frac{3}{16}$ in. o.d. Benders are tempered spring wire; each is flared to make insertion of tubing easy. Set of five is \$2.20 ppd. Brookstone Co., Peterborough, N.H. 03458.



NOW



Amphibious vacuum

Aqua-Vac picks up both wet and dry messes, both indoors and out. UL-approved unit has automatic float shut-off, now comes in 8 and 12-gal. sizes. Eight-gal. model, with accessories, sells for \$49.95 plus shipping and handling. Write Shop-Vac Corp., 2323 Reach Rd., Williamsport, Pa. 17701, for information.

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Easy-to-use stamp kit

You can make an instant rubber stamp with any message of up to three lines with Labelon Custom Rubber Stamp Kit. Outfit is designed to let you place characters the way you read them, not backwards or upside down. \$9.95. Amlast Distributors, Box 546, Fair Lawn, N.J. 07410.



Snips made for easier cutting

Aviation snips can cut 18-ga. and heavier cold-rolled steel with minimum effort by compound action, serrated blades to grip metal. Snips shown cut to left, straight and to right respectively. All have drop-forged molybdenum-alloy tool steel blades, vinyl-covered handles 10-in. long. \$5.40 each from Channellock, Inc., Meadville Pa. 16335.

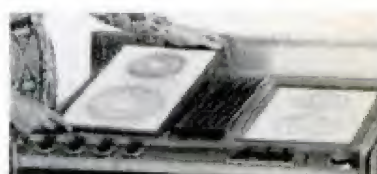
POPULAR MECHANICS

Illustrations by John DeLorenzo



Converter kit lets drill sand contours

Kit converts any 1/4-in. or larger portable electric drill into a flexible-pad sander for finishing curved or contoured surfaces. Kit includes sander pad, three 5-in. discs, tube of adhesive, drill adaptor mandrel, instructions. Price is \$5, plus 25 cents postage and handling, from MD Distributors, 69 Pheasant Lane, Cheektowaga, N.Y. 14227.



Convertible ranges

This new line of ranges offers interchangeable cooking elements with standard or ceramic burners, plug-in charcoal-flavor grill. Accessories include griddle, rotisserie, french fryer, shish kebab kit. Ranges have stovetop venting, are convertible for later built-in use. Write Jenn-Air Corp., 3035 Shadeland, Indianapolis, Ind. 46226, for prices.



Hand truck collapses to store out of way

Tuck-away hand truck carries up to 100 lbs., folds down to 20-in. height, extends to 40 in. Made of tubular steel, cart is chrome-plated, weighs 7 lbs., is suggested by maker for luggage, welding equipment, large cartons. Price is \$30.90 postpaid, plus applicable taxes, from distributor, Multi-Product Co., Dept PM1, Box 5517, San Antonio, Tex. 78201.

NOW



One-piece ax for campers

All-steel campers' ax is lightweight, fully polished, has forged-steel head, nylon-vinyl handgrip, comes with sheath. Available in 16-in. length shown or in 26-in. length, each \$11.90; with painted finish, \$11.40. Estwing Mfg. Co., 2647 8th St., Rockford, Ill. 61101 makes it.

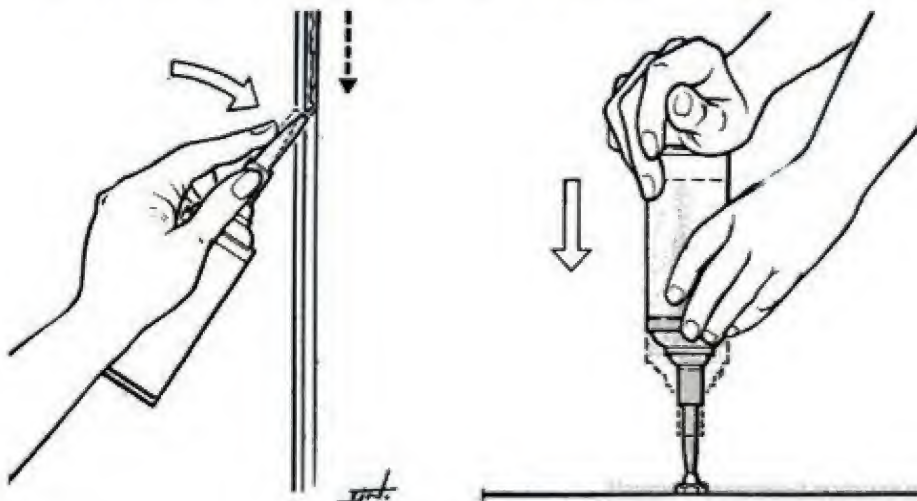
Aluminum tamer

Soft aluminum, often ornery to handle, tends to stick to cutting tools, making for a rough finish and out-of-tolerance work. Smoother cutting without buildup and a fivefold increase in tool life are claimed for Alumicut cutting oil. Nontoxic lubricant is \$2.15 per pint. Mystic Metal Mover, Inc., Route 2, Princeton, Ill., is the maker.



Grease can be applied like shaving cream

High-low-pressure grease kit can be used like ordinary aerosol, or can generate up to 1600 lbs. pressure by pumping (below, right) to fill grease fittings. Aramingo Petroleum Inc., Front and Shunk Sts., Philadelphia, Pa. 19148, sells kit for \$3.50.





Screwdriver has snap-in bits

This 4-in-1 screwdriver has two pairs of interchangeable snap-in bits— $\frac{3}{16}$ and $\frac{5}{16}$ in. wide for slotted screws, large and small for Phillips-head screws. Bits not in use are stored in the screwdriver's handle. Tool is \$4 postpaid from Screwdrivers, Box 1566, Titusville, Fla. 32780.



Illuminated screwdriver

Designed to make it easier to find screws in dark corners, this screwdriver set includes a built-in light. Illuminated tool uses two C batteries (not included) and comes with four bits. \$2.98 postpaid; A. W. Williams Unusual Product Co., 5727 Floy Ave., St. Louis, Mo. 63136.



Instant 'brick' for walls looks like real thing

Brick-Craft looks and feels like used brick but goes up fast with special adhesive-mortar; in red or antique white. For information, write The Decro-Wall Corp., 375 Executive Blvd., Elmsford, N.Y. 10523.

Diamond marker set fights crime

Operation "Stop Thief" Burglar Protection set includes diamond-tipped etcher for marking valuables, a record book and warning stickers. \$7.95; Dixie Diamond Tool Co., Box 1168, South Miami, Fla. 33143.



BIG BANG on the boardwalk



Photos by Sol Goodman

HER TWIN DOMES bobbing crazily like bubbling tea-kettle lids, the Traymore's huge 19-story main section starts to crumble (above), then comes crashing down in photo on the facing page—the biggest explosive demolition job ever attempted. Picture at right shows the elegant, historic old hotel on the boardwalk at Atlantic City at the height of her glory in the mid-1930s



It was the riskiest demolition job of his life—the mammoth Traymore Hotel in Atlantic City's bustling beach resort. Only inches away stood an art gallery of priceless treasures. He pressed the detonator . . .

By WILLIAM F. HALLSTEAD



JACK LOIZEAUX chewed an antacid stomach tablet to calm the queasy, clammy feeling welling up inside him. The countdown had started, and he inched his hand slowly toward the detonator buttons, perspiring despite the damp, chill early-morning ocean air. A demolition expert with more than a decade of faultless experience, he was not normally a nervous man. But this was different. It was the biggest blasting job he had ever attempted—the enormous block-long, 19-story, 600-room Traymore Hotel standing within feet of the boardwalk along the shore at Atlantic City, N.J. Loizeaux was going to

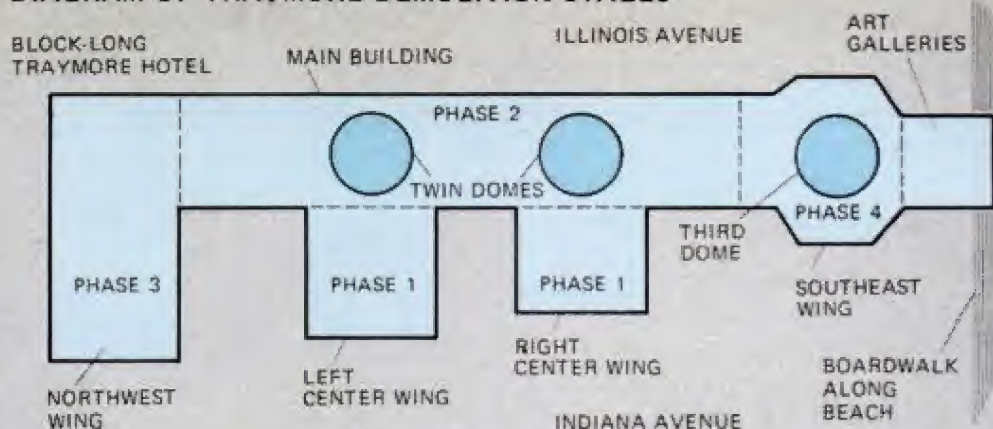
blow the mammoth structure to bits right in the heart of one of the busiest beach resorts on the eastern coast.

Curious crowds pressed closer, straining against police ropes to hold them back. Storekeepers from nearby shops waited anxiously, fearful of what the mighty blast would do to their own buildings. Officials looked on apprehensively. What if . . .

The count ended, and Loizeaux hit the detonator. There was a mild, muffled crump and for a moment the building seemed to hang motionless in mid-air like a giant jigsaw puzzle frozen in space. Its glittering golden domes—a landmark on



DIAGRAM OF TRAYMORE DEMOLITION STAGES



DEMOLITION EXPERT Jack Loizeaux (left) wires up charges embedded in a concrete-encased steel supporting column prior to blast. Diagram shows how job was done in four phases—the final, critical stage the boardwalk wing

the Atlantic City skyline for more than half a century—floated strangely intact for an instant, then suddenly the structure turned to jelly and collapsed into a neat pile of rubble before the eyes of amazed spectators. Not a fragment flew into the adjoining streets; not one nearby building was touched. A seismograph operator monitoring the blast reported a shock wave no greater than the rumble of a passing truck. Loizeaux had done it again.

In his relatively brief career as a blaster—he didn't start until 1960—57-year-old Loizeaux has become the country's foremost authority on explosive demolition. In the past 12 years, he has felled 196 buildings, 70 bridges and more than 200 other assorted structures whose age or condition made their removal necessary. It's a standing joke that he hasn't done anything constructive since he went into the demolition business. But if it isn't constructive, it's at least vastly effective. His technique is so precise and skillful it is fast replacing the painfully slow process of battering a building down with wrecking balls and sledge hammers, saving harried contractors months of precious time and hundreds of thousands of dollars in demolition costs.

Loizeaux is president of CDI—Controlled Demolition, Inc.—an imposing-sounding name for what is actually a small family operation based in Towson, Md. The tiny firm consists mainly of Loizeaux himself, his two sons, Mark and Doug, in their early twenties, and his wife, Freddie. All four—including wife Freddie—are licensed blasters. Loizeaux operates on a simple principle: "A building is about 85 percent space," he says. "You don't

have to beat it down bit by bit. Kick out its supports and it will bring itself down."

For Loizeaux, however, the Traymore represented not only the largest job he had ever tackled, but also the trickiest. The huge, sprawling, multiwinged structure was originally erected in 1907, but had undergone many modifications down through the years. Each new addition had brought with it new methods of construction, making the monster a nightmarish hodgepodge of structural engineering. Loizeaux was appalled by what he found as he walked the endless maze of underground corridors deep within the Traymore's bowels. There were at least three different types of supporting columns, some consisting of three-inch-thick laminated steel plate encased in concrete.

Still, the job had to be done. As historic as she was, the ornate, elegant Traymore had outlived her usefulness. Often the scene of lavish balls, convention gatherings and presidential visits during the glory days of the '20s and '30s, the ancient relic was suffering the ravages of age and steadily declining revenues. Her owners, unable to keep her going, were forced to order her destruction last year to clear the way for more profitable use of the valuable beach-front property.

"She was a great old lady," says Loizeaux, "but if she had to go, I'd rather give her a grand send-off this way than see her hacked to death."

Originally, Loizeaux had wanted to do the entire job in a single operation, but wary officials vetoed the idea, fearing the consequences of such a massive undertaking. It was eventually agreed to divide



TWO CENTER WINGS are first to go (right), leaving Traymore's twin-domed main section ready for removal in second stage (shown on preceding pages). Debris was cleared away after each stage to make room for more to come in the following stages, simplifying the cleanup job. (Photos above and below by Ken Sooy)

the demolition into four stages—the first to remove the twin side wings, the second to remove the main structure, the third to remove the rearmost wing back from the boardwalk, and finally the fourth to bring down the beach-front section—the most familiar facade to boardwalk strollers for more than six decades.

The first three stages went smoothly. Loizeaux drilled carefully spaced holes in the concrete casings surrounding the steel columns and filled the openings with shaped charges of RDX—one of the most potent explosives available and the main ingredient in what is commonly known as plastic explosive. Conventional TNT burns relatively slowly, dissipating much of its energy before the full force of its blast develops. By contrast, RDX burns rapidly, delivering an intense, concentrated punch that can slice through foot-thick steel columns like a knife through butter.

The initial blasts came off without a hitch—all 19 stories plummeting straight to the ground with no flying debris or danger of damage to adjacent buildings. It was when Loizeaux got to the fourth and final stage that he began to sweat. Immediately in front of the remaining wing and attached to it was the Traymore Art Galleries annex. This low building, containing delicate art treasures valued at up to \$2500 apiece, was to be left standing. Loizeaux would have to bring down the Traymore wing without the slightest jar to the annex—or risk a fortune in irreplaceable art. To make matters worse, the upper part of the wing extended eight feet over the annex, hanging threateningly above the fragile building below. Impossible?

Loizeaux agreed to make the attempt if the contractor would first manually cut an 18-foot-wide gap between the Traymore wing and the gallery annex. When he returned later to start setting the charges, however, he found to his horror not the 18-foot cut he had asked for but a skinny little 6-inch slot! Four other explosive experts are called in for their opinions and each says he wouldn't touch the job. An alarmed architect warns that the Traymore's seaward wing—the oldest part of the structure—has deteriorated badly in the salt air and the overhang may tear loose and crash on top of the gallery.

Felling a building is something like felling a tree—you have to undercut it in the

(Please turn to page 168)



LAST REMAINING WING stands forlornly alone above, awaiting death blow that will end the once-mighty Traymore forever. In photos at right it topples neatly to the ground, successfully missing nearby treasure-filled art gallery by inches. All that's left of the historic hotel: a small mound of rubble



What I learned about driving from a motor home



By JOE LEONARD
USAC National Driving Champion



CHECKOUT of motor home or racing car, before starting, should include adjusting side mirrors, circling vehicle to note anything loose or out of place, Joe Leonard reports



FEEL OF VEHICLE must be acquired on or off track, Leonard finds. Driver should frequently glance at mirrors, concentrate on smooth momentum, avoid distracting conversations

WHEN I FIRST thought of using a motor home on the racing circuit, I had my doubts. I'm used to quickness on the track and the highway. A motor home looked awfully big and clumsy. But I needed a mobile headquarters to keep my gear as I moved from track to track. A motor home appeared to be the answer, and estimates are that this year 150,000 buyers will agree.

So a year ago I decided it was worth learning to drive differently. I was plenty nervous as I first headed out with my new 28-foot Swinger Statesman. But driving a motor home turns out to be a lot like handling my Samsonite Special at the Indianapolis 500. You have wheels and a powerful motor, and you're conscious of wind, road surface, traffic conditions. You drive with the same



REAR DUALS should be checked for proper inflation at "pit stops." Inside tire may be soft but look right as outside tire carries weight. A long-stem pressure gauge is needed

POPULAR MECHANICS

defensiveness and somewhat the same feel. The big difference is that at Indy I'm trying to get there first. In my motor home I'm only trying to get there safely and comfortably. I don't care who passes me.

Before starting my engine, I walk around the rig just as I do my racing car, checking tires and anything loose. When I was nine, I earned a nickel for every tire I changed at a gas station in San Diego. I rolled a lot of tires, and I'm a nut about proper inflation. I use a gauge on all tires. You can be fooled by the inner tires of rear duals if one is soft and the outside tire is supporting it. I also adjust both mirrors. Track drivers learn the knack of flicking their eyes right to check the "blind" side. So must motor-home drivers.

I didn't expect a motor home to give the power and response mine does. I would never drive mine flat out as I do the Indy straights, but when entering a freeway I want to accelerate up to traffic speed. I hold my Swinger at about 60 mph, sometimes on automatic cruise control, but not above, and drop to 50 in heavy traffic.

The bulk of their 'rig scares some motor-home drivers when they want to pass. Using steady momentum without gas-eating surges, I get my speed up and go around under control without gears shifting. Though a motor home is



GENERATOR is also powered with an engine needing a daily maintenance exam. Leonard recommends an oil-level check as part of rig's regular "preflight"



MANY APPLIANCES, accessories in home must be secured. Leonard pin-locks refrigerator door



REST STOP in motor home can mean a cup of real coffee from rig's galley while reading a map



POWERFUL ENGINE is not needed for speed (Leonard drives motor home at 60 or below), but provides momentum for entering freeways, smooth passing

less likely to surf on wet pavement, I avoid passing when it's rainy or the road is icy. I've driven on enough track oil slicks to have respect for oil-water mix on the highway. Frequent pit stops are a must; motor homing is so restful and comfortable that you can become overconfident. While driving I don't join in with conversations in back, and want everyone seated while underway. Especially with my wife, Diane, and our kids, Joey Jr. and Debbie, along, I want to be as alert as I am Memorial Day.

Last year I drove my Swinger 11,000 miles and will probably cover even more with this combination office-home in '73. You develop a feel for its smooth momentum. I find I've learned to like it. ★★★

600 hp from 454 cubes!

Marine conversions prove their power in racing



ENGINE ACE Carl Kiekhaefer (right) reveals rig's secrets to PM's McKeown

GOAL of aircraft engineers used to be one horsepower per cubic inch of piston displacement. But now E. Carl Kiekhaefer, mechanical magician of Fond du Lac, Wis., who created the Mercury outboards, has roared right by that high-flying target. Switching to inboard engines and a new company called Kiekhaefer Aeromarine, he's producing racing conversions that top 600 hp, plus a new line of mills from 200 to 380 horses for more modest craft.

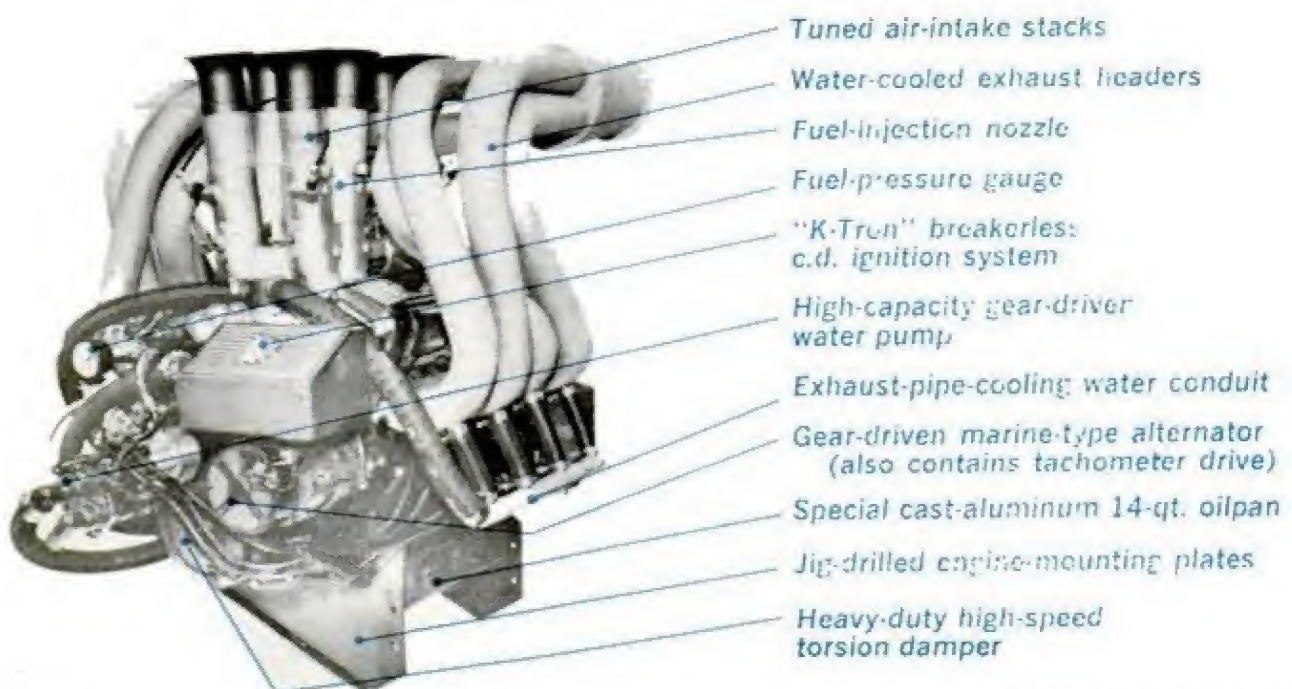
Equally amazing is the sustained performance of K.A.M. rigs at continuous rpm of up to 5800. Kiekhaefer engines in Doc Magoon's *Aeromarine III* won the national offshore championship last year in boat racing's roughest league.

Secrets of these new high-performance mills include fuel injection, tuned intakes and exhausts, c.d. ignition plus electronic governor. All pumps, accessories, alternator are gear driven (no belts to break). Oil pan is oversize; beefed-up dampers, heavy duty. Yet these potent machines even idle docilely—something their inventor seldom manages.

—Bill McKeown



PROOF OF POWER was Doc Magoon's 82-mph record and championship year



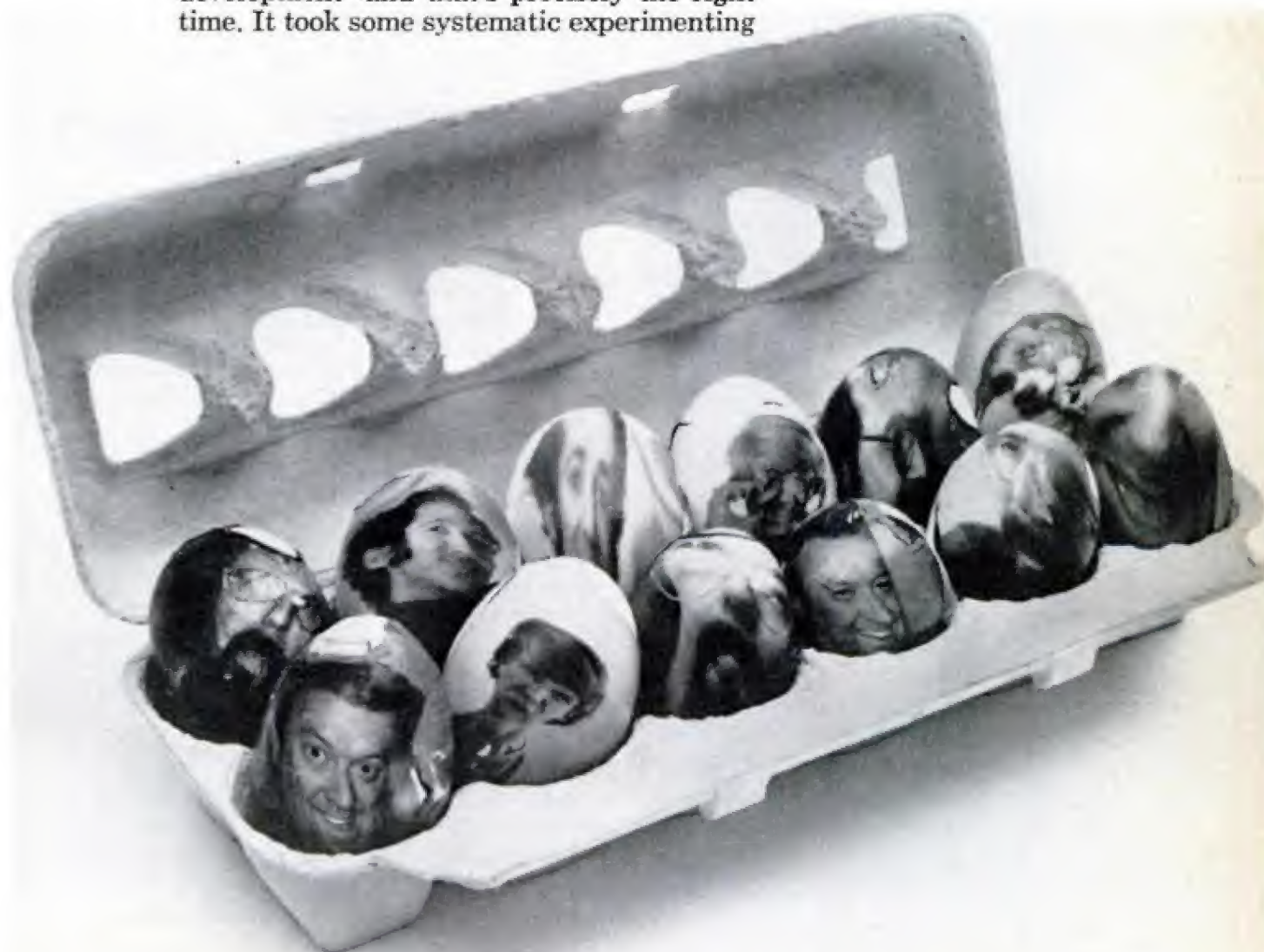
Fun with Polaroid's tricky new film

CURIOS about the inner workings of Polaroid's new, sealed-in-plastic SX70 color film (see *Our dream was to change photography*, page 104, March *PM*), I cut apart my first bad shot (of a fellow editor, shot from an unflattering angle) to see. I found a rubbery emulsion that could be peeled from its plastic covers and stretched—picture and all—into hilarious caricatures. Or even (as you see below) wrapped around beer cans, broom handles, or eggs.

But it was all a stroke of luck. If I'd opened the picture later, the emulsion would have been so well bonded to the plastic that I'd have had trouble pulling it free. Earlier, and I'd have found the emulsion too soft to stretch without ripping. By accident, I'd tried it just as the film had reached its full development—and that's precisely the right time. It took some systematic experimenting

By IVAN BERGER
Photography Editor

Photos by Peter Schneider





1. STRETCHING PICTURES is easy with new SX70 film. Trim away three of picture's white-tape borders, then peel back the upper, clear-plastic layer



2. PEEL emulsion off black Mylar backing, stretching as you go. Lay emulsion back on black layer, lay clear plastic over it, cut off excess emulsion



5. PHOTOS ON EGGS or other three-dimensional objects are only a bit trickier. Trimming and initial peeling are the same as for the flat, stretched pictures in the sequence at the top of these pages



6. DEPENDING on effect you want, you may stretch the image as you peel it, or remove it from its backing with a minimum of stretching. In latter case, you can choose your distortion as you wrap film on egg

before I rediscovered the precise timing I had gotten by beginner's luck.

PM photographer Robert D. Borst, who helped with the experiments, came up with a helpful tip for stretching pictures already old enough to stick to the plastic—soften them with a hot-water bath before you cut them open. It works, if you're careful, but it's tricky. Because the emulsion is water-soluble (normally it's inside waterproof plastic, of course), you have to make sure both the picture and your fingertips are dry before you peel the plastic off—yet you must do it fast enough so that the picture won't cool off while you're drying it.

The photos on these pages show how to do it. Since the process isn't exactly

cheap (nearly 70 cents a shot for the film, and nearly \$1 per shot with flash) and its results are unpredictable, it pays to practice on shots you'd otherwise throw away. Once you get the hang of it, you'll begin composing your pictures with distortion in mind: It helps if you leave some empty space within the frame on the side toward which you plan to stretch the emulsion. That way, you won't cut off anything important when you trim the stretched emulsion to the size of the plastic covers before resealing the edges.

Once you've had some practice with simple stretching, you're ready for the slightly more difficult task of removing the emulsion altogether to apply it to three-dimensional objects, such as the



3. SEAL EDGES of the photo with a clear plastic tape—and you wind up with a finished print that is neatly sealed back in its protective covering



4. FINAL RESULTS (above and at left) depend on your eye and your luck. But at 69 cents a shot, better practice first on pictures that you don't like



7. THIS PICTURE was distorted before we began to wrap it on the egg. The tricky part is avoiding wrinkles as you lay the flat (though stretched) image on any three-dimensional object like this



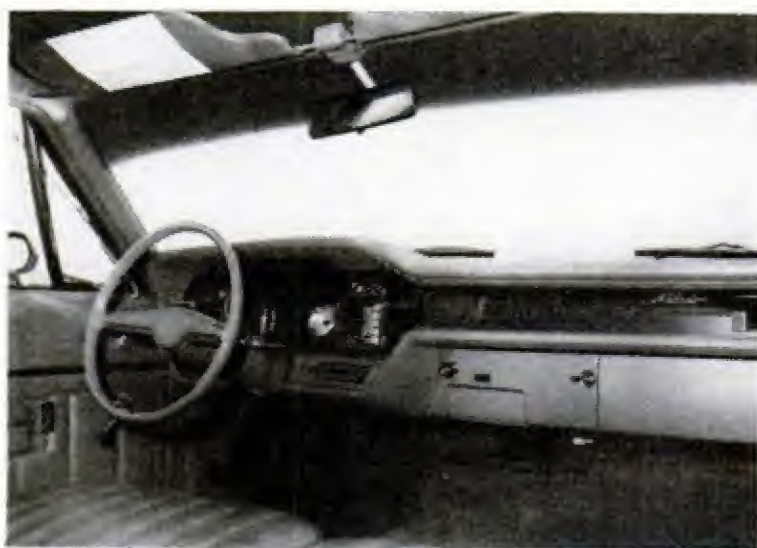
8. HERE, WE SUCCEED in avoiding wrinkles, though the edges of the image are a trifle ragged. In the photo in page 129, this is the third egg from the left, back row. Some other eggs are wrinkled, though

eggs shown here. The stretchy emulsion is just sticky enough to cling to other surfaces, and seems to bond itself to eggs, tin cans and other objects as well as it bonds to its original plastic backing. My Polaroid eggs are as much as two months old, as of this writing, and only one image has peeled off its egg in that time. But the soluble emulsions should be protected from water. If your climate is damp or humid, you might find it necessary to spray your eggs, rocks, or other Polaroid-carrying objects with a plastic protective coat. And if you're using eggs, be sure to blow the contents of the egg out through large pinholes at each end before applying the picture—there's little enjoyment in a three-dimensional photo that smells

like a rotten egg. This tricky bonus in Polaroid's new film (which fits only the new SX70 camera) is due to its unique structure. Other prints (including Polaroids) are made of gelatin emulsions firmly bonded to absorbent paper bases, with chemicals reaching the emulsion from its face and through the paper backing. Since the SX70 film's emulsion develops from the back, it must be faced with transparent plastic, which is easy to peel away. Since the chemicals must stay inside the film packet, it is backed with plastic, too. The plastic cover has other advantages: It's hard to scratch and almost impossible to scrape off, and it keeps the print from curling. But peel it away, and you have the makings of a whole new art form. ★★ ★



MATADOR BODY STYLES include two-door hardtop, four-door sedan and a wagon which is very popular (26.4 percent of owners). Though the inside hood release and vent wings are hard to find, they are practical and AMC buyers do appreciate them. Owners would like to see the ashtray relocated or a second one added. Reclining front seats in wagon help to convert interior into camping quarters



PM OWNERS REPORT: AMC MATADOR

It's a strong and agile,

By **MICHAEL LAMM**, West Coast Editor
Photos by the author

BACK IN 1970, when the Matador was still known as the American Motors Rebel, owners griped a bit about sloppy assembly, rattles and wind noise.

Just for the heck of it, I went back and compared responses from 1970 Rebel owners with these we'd just received from owners of 1973 Matadors. Had anything changed in those three years? Was there a difference in owner attitudes or in the cars themselves?

Yes on both counts. Most important, I believe, is the conclusion that AMC has apparently improved the quality of its cars. For example, in 1970, 15.3 percent of Rebel owners listed "poor workmanship"

as a primary dislike. This year that figure is down almost half—to 8.2 percent. Rattles are down by 8.3 percentage points and complaints of wind noise are down by 4.3 points.

Similarly in 1970, 34.2 percent of Rebel owners cited "good handling" as a specific like. This year, 48.9 percent do—a rise of 14.7 points. Does that mean that the Matador now handles better at the expense of riding quality? Apparently not, because ride came up 10.1 percentage points at the same time.

In other words, American Motors must be doing something right. Or righter. Its 1973 Matador is basically the same car as the 1970 Rebel, yet owners rate it higher on many important aspects—quality, ride, and handling. They point out fewer me-



A nationwide survey based on 1,000,000 owner-driven miles

but thirsty, Matador!

chanical defects and claim better dealer service.

Whenever we survey owners of American Motors cars, we always notice a big group of repeat buyers—people who've been with AMC even from Nash and Hudson days. As before, we've found plenty of owners listing "past experience" as their main reason for choosing the Matador. But our 1973 questionnaires show that AMC is making a good many more "conquest sales" this year than before. We've come to that conclusion because for 1973, only 35.3 percent cited "past experience" as their primary reason for buying, whereas in 1970, 53.0 percent gave that reason. All other reasons for buying Matadors remain as listed for Rebel in 1970—with the same percentages.

MAY 1973

There's a down side in this comparison, too. Gripes about poor gas mileage are up 7.7 percent, from 14.1 to 21.8. Average miles per gallon for the 304-c.i.d. V8 are down 1.6 and 0.7 mpg for local and long trips respectively. That's not too bad, but unfortunately we have no figures to compare fuel consumption of the 232, 258, 360 and 390/401 engines.

Many more Matador owners chose six-cylinder models this year than Rebel owners did back in 1970. That year, 85.7 percent opted for the 304-c.i.d. V8. This year only 54.2 percent did, and 30.0 percent went for the Sixes as against 2.2 percent in the Rebel. (Industry-wide, sales of Sixes are down, V8s and Fours are up.)

But let's let Matador owners have their own say about their cars. "I needed a car



THE 304 V8 ENGINE is most popular with owners. Smog controls make engine hard to tune, say many



SPARE COVER UNSNAPS, bins are lockable. Safety switch keeps tailgate locked with the engine running



with reclining seats," notes a handicapped retiree from Maine, "and the Matador was in our price range." "Quality and workmanship are better than in previous AMC cars."—New Jersey accountant. "I bought my car specifically for AMC's Buyer Protection Plan."—Michigan interior decorator. "Sensible transportation," says a Massachusetts salesman.

A few owners questioned AMC's new name, Matador. "Why Matador?" asked a longtime AMC faithful. Another said he can't get used to calling his car anything but a Rambler. Fact is, AMC decided to rechristen its intermediate to attract a younger segment of buyers. Ramblers were known as economy cars for older citizens, and then when AMC renamed it the Rebel, that became the year of campus unrest, and the word "rebel" in headlines carried an unsettling connotation.

The question remains, has the name "Matador" helped lower AMC's buyer age? Again, in comparing PM's 1970 Rebel

questionnaires to these 1973s, I find that Matador owners are slightly younger than Rebel buyers were three years ago. The 15-29 age group is now 1.5 percent bigger, 30-49-year-olds picked up 5.8 percentage points, and owners over 50 dropped by 8.6 percent. Even so, nearly half of all Matador owners are still 50 and older. When AMC sees Chevelles selling so briskly to young marrieds, it brings tears to their eyes, and that's one reason AMC is putting so much emphasis on Mark Donohue's Matador successes in stock-car racing.

What praises do Matador owners lay on their cars?

"Hooray for the engine heat gauge—now if there were only a couple for amps. and oil." "I like the individually adjustable, reclining front seats." "Plenty of room inside this car and trunk." "Designed for driver satisfaction. Manufacturers are finally thinking of the people who buy their cars and not the people who sell them." "Good handling, easy to



CARGO NET, part of visibility group, prevents grocery bundles from falling forward in sudden stops



MATADOR'S STYLING plays only a middling role in sales. Biggest reason for buying is past experience

POPULAR MECHANICS

Matador: a successful answer to the question

Summary of 1973 AMC Matador Owners Reports*

Total miles driven	1,062,614
Average miles per gallon:	
232-cu.-in. Six: local driving	16.1
long trips	17.9
258-cu.-in. Six: local driving	14.2
long trips	17.5
304-cu.-in. V8: local driving	12.7
long trips	15.6
360-cu.-in. V8: local driving	11.5
long trips	14.3
401 V8 (sample too small)	
Body styles:	
Four-door sedan	63.0%
Two-door hardtop	10.6
Four-door wagon	26.4
Engines:	
232-cu.-in. Six	7.7%
258-cu.-in. Six	22.2
304-cu.-in. V8	54.2
360-cu.-in. V8	14.4
401-cu.-in. V8	1.4
Transmissions:	
Automatic	97.6%
Manual 3-speed	2.4
Why did you buy a Matador?	
Past experience	35.3%
Styling	19.0
Size	15.2
Economy	13.1
Price	9.3
Specific likes:	
Handling	48.9%
Comfort	30.3
Styling	27.7
Ride	22.3
Spaciousness	16.4
Economy	16.1
Specific dislikes:	
Poor gas mileage	21.8%
Wind noise	8.6
Poor workmanship	8.2
Rattles	4.6
What changes would you like?	
Different seat shape/style	8.9%
Better gas mileage	8.0
Better rear vision	7.6
Different door handles	5.3
Had any mechanical trouble?	
No	68.4%
Yes	31.6
What type of trouble?	
Electrical	15.1%
Oil leaks	8.6
Transmission	7.5
Power steering	6.4
Battery	6.4
Did you repair it yourself?	
No	95.7%
Yes	4.3
Dealer repairs satisfactory?	
Yes	84.0%
No	16.0
Is the Matador your only car?	
Yes	60.6%
No	39.4
Other cars owned:	
Other AMC vehicles	32.2%
Chevrolet	16.9
Ford	10.2
Volkswagen	5.9
Workmanship opinion:	
Good to excellent	75.2%
Average to poor	24.8
Dealer service opinion:	
Good to excellent	60%
Average to poor	40%
Age distribution of owners:	
15-29 years	13.3%
30-49 years	39.9
50-plus	46.8
Would you buy another Matador?	
Yes	89.3%
No	10.7

*Percentages might not equal 100% due to rounding or insufficient data.

drive." "AM/FM stereo radio has beautiful sound." "It is a nice-looking car, very classy."

Now what about complaints?

"All that plastic inside creaks as the pieces rub together." "Headrest is too far back for comfort when reclining." "Poor gas mileage." "I don't like the way it takes bumps—shocks could be improved." "Seats need some beefing up for greater comfort. I weigh 200 pounds and keep hitting bottom on bumps." "Swaying in crosswinds; wind noise around doors."

What changes would owners like to see?

"Redesign those door handles—I keep pinching my fingers." "Make disc brakes standard equipment." "Relocate the front ashtray or give us two of them in the dashboard." "Take off the antipollution junk. No one seems able to tune the engine right with it." "Improve gas mileage." "One size bigger tires." "Relocate the trunk light. I've replaced two bulbs that have been broken by closing the decklid." "Make spare easier to take out of wagon; also make tools removable without having to remove tire."

Whenever we question owners for these reports, we always invite additional comments on the backs of our forms. Sometimes these little essays tell us more than answers to questions. Here are some:

An attorney from Peekskill, N.Y., writes, "The Matador's trailer package is particularly good. Also the sparkplugs are accessible, as is the oil filter, so it's a good car for maintain-it-yourselves."

A Wisconsin priest says: "I went to the dealer armed with all the price information—list, wholesale, trade-in value of my old car, etc. I found all his money attitudes to be honest, although he didn't know I knew. I'm sure that if I hadn't already known his exact profit, he would have told me if I'd asked. I like people like that. I will return again to buy from an honest man."

The chief executive officer of a New York school notes, "Have been with Nash, Rambler, and AMC exclusively since 1950. Have always thought they were better built. Mileage used to be very good, but no longer, of course. But I have a tremendous dealer—good deals, good service, very reasonable. Sometimes he says, 'No charge—that's our car and we expect to get it back from you at trade-in time.' They always have, and I guess they always will."

American Motors is back in the black and obviously they're turning out good cars. More important, they're innovative, and innovation is helping them pick up new, younger buyers. ★ ★ ★

Giants of the road: Why they cost so much

A great array of optional equipment confronts the buyer of a custom-built rig. To get the right package, he needs \$30,000 or more plus buying know-how learned only in the driver's seat.

By JACK WILDERBERGER

TRUCKER DICK ERICKSON recently spent a month at the Freightliner plant in Portland, Ore., watching his new rig being assembled. From time to time, he conferred with the engineering staff to make sure that the package of optional equipment would meet his needs. Buying a big rig is serious—and expensive—business. Erickson shelled out \$33,300 for his.

Neither the price tag nor Dick Erickson's attention to detail is unusual. It's estimated that over half of the big rigs sold are custom-built. The most frequent buyer is the independent owner-operator—a man who knows what he wants. Usually, he decides on the make and model of engine, the transmission, rear axle and other basic components even before he chooses a make of truck. In his business, "optional equipment" comes first.

Some of the top makes are unfamiliar to the average motorist: Peterbilt, Kenworth, Freightliner, Diamond Reo. Others, perhaps better known, include International, Mack, Ford, Chevrolet, GMC and Dodge. Engines to power these bruisers are made by Cummins, Caterpillar, Detroit Diesel and others.

A total of 19.5-million trucks of all types were registered in the United States in 1972, according to the American Trucking Assns. Of these, almost 1 million were big-rig, tractor-trailer combinations, a category that includes everything from three axles and up. Nearly half a million of these "combos" were registered to owner-operators.

These "for hire" rigs haul all kinds of freight: machinery, lumber, dairy and farm produce, dry goods and a host of manufactured items. Trucks, reportedly, carry almost 100 percent of all livestock

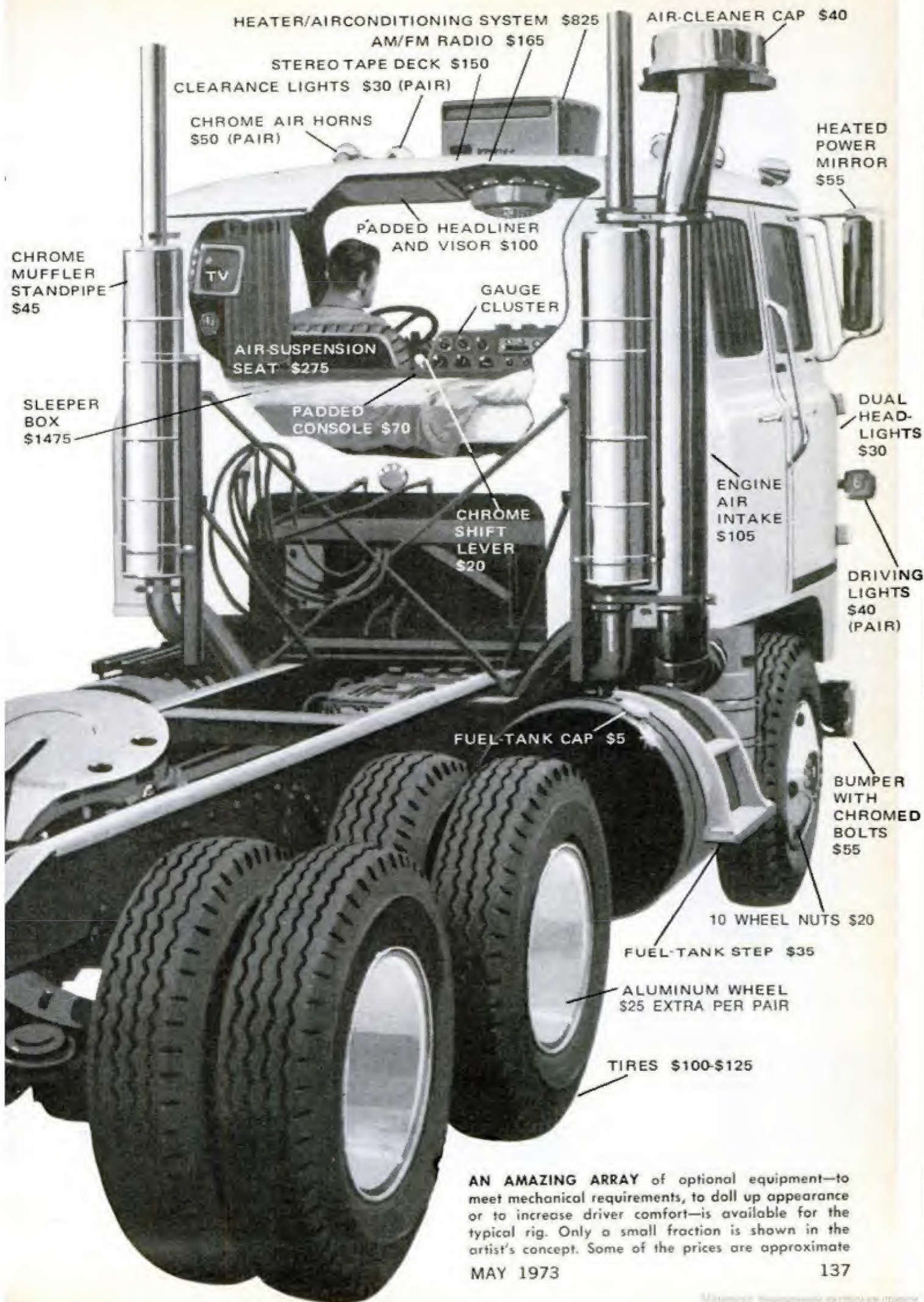
and 66 percent of fruits and vegetables delivered to major markets. With a cargo of average value, a fully loaded tractor-trailer may represent a total investment of better than \$75,000.

Climb into a big cabover tractor (cabover design allows builders to make a shorter truck to comply with legal restrictions on length), adjust the seat for comfort and take a look around. Overhead, in the center of the cab roof, is the airconditioner control panel. Just above the windshield are the AM/FM radio and tape deck.

Looking through the big steering wheel, you see the speedometer and the tachometer (with engine-operating range clearly marked). Scanning to the right, you see an array of dials that would look at home



Illustration by Ed Valigursky



AN AMAZING ARRAY of optional equipment—to meet mechanical requirements, to doll up appearance or to increase driver comfort—is available for the typical rig. Only a small fraction is shown in the artist's concept. Some of the prices are approximate

MAY 1973



NEW LINE from International is the Transtar series of tractors. Single and tandem-axle versions are available. The standard engine is a 230-hp diesel



BIG DIAMOND REO hauls a heavy load on a flatbed trailer. Rigs used for heavy work in mountain areas usually are ordered with an axle ratio of 6.14 to 1



ANOTHER POPULAR MAKE is the Peterbilt. Model shown has tandem rear axles, sleeper box, enough bright metal to satisfy the most finicky of drivers

Truck-jockey jargon

- Truck jockey—truck driver
- Bareback—tractor without trailer
- Spot it—to park trailer
- Peanut wagon—small truck pulling trailer
- Boll weevil—novice truck driver
- Hood lifter—garage mechanic
- Donuts—truck tires
- Pajama wagon—truck with sleeper box
- Cackle crate—poultry-carrying truck
- Load of post holes—empty truck
- Anchor it—hit brakes for emergency stop
- Aviator—speeding driver
- Balloon freight—lightweight freight
- Bean hauler—fruit-vegetable carrier
- Big hat—state trooper
- Bull hauler—livestock hauler
- Dog—truck with little power
- Flat face—cab over engine
- Kick down—shifting to lower gear
- Milk run—easy trip
- Minnie—less than 100-pound shipment
- Pig—trailer transported on flatcar
- Pigtail—electric cable to trailer
- Shag—small city trailer
- Sick horse—rig with mechanical problems
- Swamper—driver's helper



LIKE OTHER MAKERS, GMC builds tractors of conventional and cabover design. The legal length requirements are easier to meet when cab rides over engine



STEADY RUN for Dick Erickson and his \$33,300 Freightliner is from Texas to Alaska. With comfort in mind, Dick ordered sleeper, air-suspension seat

in an airplane cockpit. In addition to standard fuel and water-temperature gauges, the cluster includes temperature gauges for the engine, transmission and rear axles; fuel-pressure gauge; pyrometer (registers exhaust manifold temperature) as well as voltmeter (shows battery condition), ammeter, and air-pressure gauges.

Way over to the right—a typical cab is nearly eight feet wide—is the passenger seat, usually a simple bench with a toolbox underneath. (If your wife rides with you, it had better be an air-suspension seat.) Behind you in the back of the cab, may be a sleeper box.

Dick Erickson makes his home in Rapid City, S. D., but hauls oil-field equipment from Texas to Alaska. Creature comforts are important to him. That's why his new Freightliner boasts a TV set and a full-sized third door leading into the sleeper. The door gives him easier access than would be provided by the standard crawl space behind the seat.

According to Dept. of Transportation (DOT) regulations, a driver must rest for 8 hours after 10 hours at the wheel. Watchdog of the industry, the DOT requires every driver to keep a log of his driving time. That's why virtually every long-haul truck has a sleeper compartment. A sleeper is similar to the top bunk of a cabover camper—wall-to-wall mattress.

When a driver is going it alone, most



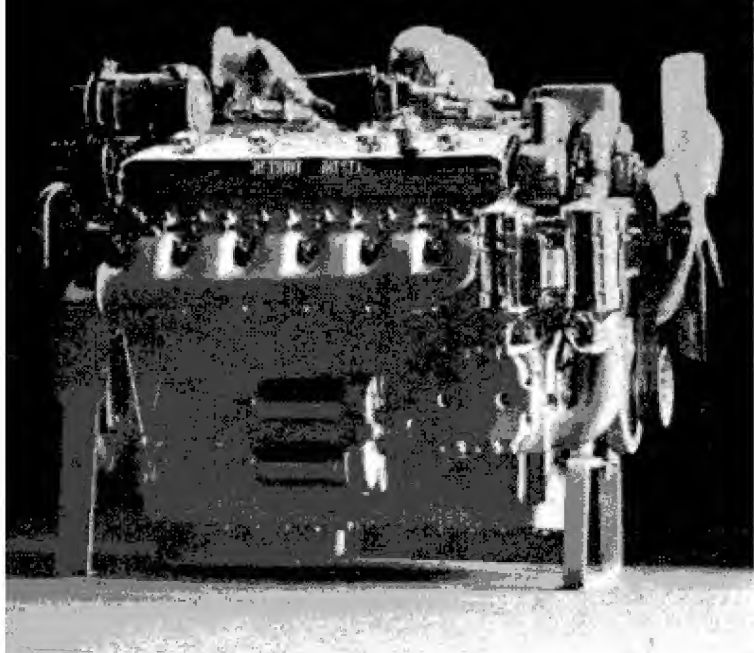
TYPICAL SLEEPER is wall-to-wall mattress and it may be airconditioned. Padded full door, for easy access, is optional and adds to cost of "bedroom"

usually the case, he likes to bed down with his rig and its valuable cargo. Besides, there are stretches—as on parts of Dick Erickson's Alaska run—where motels are a rarity.

Frank Hlebakos is another man who likes his comfort. Frank and his son, Dan, haul produce and frozen foods in five western states. They spent \$34,375 for a sharp-looking Kenworth that boasts tucked and rolled upholstery, which must be worked by hand, is expensive and is usually reserved for custom-built limousines. Frank and Dan have air-ride seats



SAMPLING of the exterior doll-up items available for International's Transtar trucks includes a gleaming fuel tank, gleaming wheel and hefty bumper



DETROIT DIESEL 12V-71 was the choice of driver Frank Hlebakos. It weighs 3350 pounds, delivers up to 456 hp (525 hp if turbocharged) and costs \$11,000

—“the only way to go.” Air acts as a shock absorber and is regulated according to a driver’s weight. The seats are fully adjustable, assuring maximum comfort. Long-haul truckers will tell you they’re worth every penny of their \$275 cost.

Choosing a seat is one thing. Picking the right engine—and transmission and rear axle to go with it—is more complicated. Many drivers swear by the powerplants produced by the Cummins Engine Co., long the leader in supplying diesels to the trucking industry. Cummins offers a complete line, including a turbocharged V8 that delivers 320 hp at 2600 rpm and a six-cylinder workhorse with a rating of 370 hp.

Frank and Dan Hlebakos chose a Detroit Diesel 12V-71 to power their Kenworth. Made by Detroit Diesel Allison Div. of General Motors, these engines are a two-cycle design and have no intake valves. Air is forced into the combustion chambers by a huge blower, and the engine delivers power on every stroke.

The 3350-pound 12V-71 delivers 525 hp when it’s turbocharged. Frank and Dan chose it because of its power—not its price, about \$11,000. They may eventually pull two 40-foot trailers in tandem with their rig.

Another comer in the engine field is Caterpillar, famous for its earthmoving equipment. Dick Erickson put a 375-hp 1693TA Caterpillar in his Freightliner because he likes “the power and dependability of the Cat.”

After a trucker decides on an engine he must choose the right transmission to transfer power to the driving axle. Here the field narrows. Fuller and Spicer are the leading suppliers, and they can provide transmissions with anything from 5 to 20 speeds. Many truckers favor the Fuller Road Ranger, a single-stick transmission with from 10 to 15 speeds. A more complex system couples a five-speed main box to a four-speed auxiliary, a twin-stick combination that produces 20 forward speeds and 4 reverse. This may seem like an excessive number of speeds, but they are all necessary for trucks that must meet the full range of varying road and load conditions.

A rig pulling a fully loaded trailer may use every gear to get up to road speed which, depending on speed laws, may be as high as 65 mph. You will find most rigs running right at the speed limit over flat terrain. In the mountains they slow down a bit. Obviously, a truck hauling 20 tons of steel can’t zip up a steep grade the way passenger cars do. It may take such a rig several hours just to climb over 7240-foot Donner Summit when leaving California.

Mountain driving is where the good driver really shines. The idea is to keep the engine running within its ideal operating range, and not to lose momentum when downshifting. This can be difficult at times. Engine operating range encompasses only a spread of about 600 rpm (over or under 2100 rpm), which means the engine should run at a fairly constant speed. This is where the 15 or 20-speed transmission, with its close gear ratios, plays a major role.

As the rig crowns over the mountain pass in third gear at 25 mph, the engine is hot. Rolling down the other side, with subsequent quick cooling, could be disastrous to some engines. The engine must be cooled slowly, either by using the lower gears going down, or pulling off the road and letting the engine cool at idle speed. This precaution isn’t necessary with some newer powerplants that have sophisticated cooling systems.

Any rig that runs the mountains as well as the flat lands will usually have a rear-end ratio of around 4.44 to 1. On the other hand, a logging rig that works in the mountains full time will have a ratio of around 6.14 to 1, sacrificing speed for

power. Choice of rear-axle ratio depends on engine size and transmission gear ratios, as well as the terrain. All these things are figured by slide rule or computer. There is no guesswork when you are buying a \$30,000 truck.

The idea behind the computations is to keep the engine running at an efficient, constant speed. In addition to lasting longer, an efficient engine will use less fuel. Dick Erickson was in Alaska when this article was in preparation, so I asked his wife, Evelyn, if fuel consumption were a major concern. "It certainly is," she replied. "We figure that one extra mile per gallon of fuel adds up to \$2100 a year, or a new house every 10 years."

Dick's rig sports twin 140-gallon, heated fuel tanks. Heated tanks are a must when running in very cold country because diesel fuel gets like jelly at low temperatures. Fuel tanks as big as 140 gallons are not common; most truckers are satisfied with twin 75 or 80-gallon tanks. A rig will usually average about 3 to 5 miles per gallon, and a gallon of diesel fuel will go for approximately 30 cents at a typical truck stop.

Truck components are fairly interchangeable, so after a trucker decides on his basic components he must then pick the truck to put them in. Truck manufacturers are in close competition, with International enjoying first place with about 25 percent of the heavy-duty truck market. "Heavy duty" means 33,000 pounds gross vehicle weight and up. Hot



CURVED INSTRUMENT PANEL surrounds the driver of a GMC Astro tractor. Speedometer and tachometer are seen through wheel. Other gauges are clustered

on International's heels are Freightliner, Mack and Ford. If any one make were considered the "Cadillac" of rigs, there wouldn't be any competition because every trucker wants quality.

The big rigs are ordered in much the same way a car is except that there is an engineering staff available to help with special problems such as Dick Erickson's twin 140-gallon fuel tanks. Since fuel alone weighs five pounds a gallon, you can't hang fuel tanks just anywhere you please.

After a rig is ordered, it usually takes two to three months for delivery. During that time the buyer may consult frequently with the dealer or even travel more than 1000 miles to visit the plant, as Dick Erickson did.

Once on the road, the rig runs and runs. Frank Hlebakos puts about 150,000 miles a year on his trucks, and expects his new 12V-71 engine to go 400,000 to 500,000 miles before a major overhaul. That kind of service is typical. Most truckers usually trade in a rig after five or six years of operation.

It isn't only the owner-operator who goes in for the custom-built tractor sporting touches of chrome and a fancy paint job. Even some fleet operators now order them on the theory that a driver who's proud of his rig will work harder to keep it up. And that makes sense when you consider that a big rig costs as much—even considerably more—than many a new house. ★ ★ ★



CHEVROLET'S CONCEPT of gas-turbine transport of future is fiberglass and a steel Turbo Titan III. The experimental design even includes "astronaut" seats

Drivers' test: Shasta motor home

By JIM LISTON, Editor

SHASTA INDUSTRIES, a builder of trailers since 1941, was among the first to offer a motor home on the 1971 Ford Econoline 123½-inch wheelbase chassis. Called "chopped vans" by the industry because the original van body had to be cut off before the coach body was built behind the cab, these small rigs are now more aptly called mini motor homes. Self-propelled and self-contained, they fit the term and fill the bill for many families who are looking for something smaller in size and price.

What the Shasta 17-footer has to offer the buyer who's leery of big vehicles is (1) an \$8000 price tag that's closer to a Cadillac than a Greyhound; (2) an easy-

handling rig with comfortable living space for four passengers.

Popular Mechanics ran a 12-month, 12,000-mile test on a 1971 Shasta 17. We selected Shasta because the manufacturer offers as standard equipment everything it believes the buyer wants and needs in this type of vehicle. The only options are carpeting and a furnace with built-in circulating fan. (The cab is carpeted; the floor of the coach is covered with good-quality vinyl.)

The interior surprises you with its feeling of cheerful spaciousness. (Interior height is 6 feet 3 inches.) A U-shaped, convertible rear dinette has large glass areas on three sides; skylights brighten





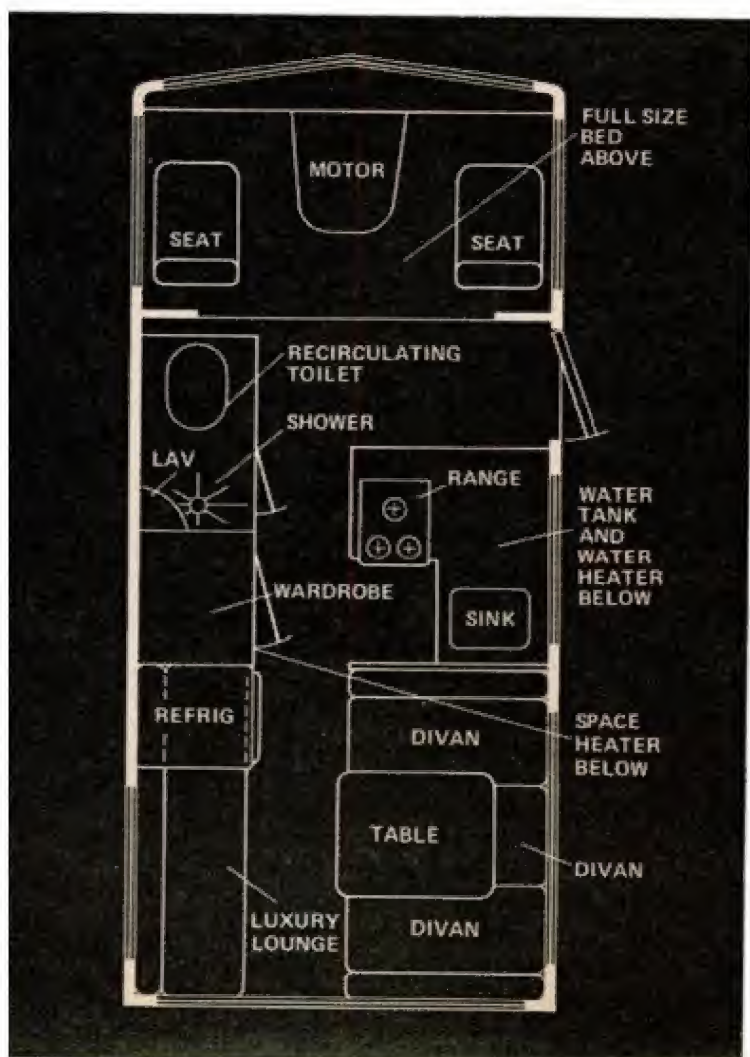
SHASTA 17-FOOTER uses Ford 123.5 or Chevy 125-inch chassis. Rear dinette seats six, converts to double bed, has storage drawers under seats. Good lighting includes two 110-volt fixtures.

the kitchen, dinette and bath; mirror glass on the refrigerator and exterior of the wardrobe door "open" this wall. Cabinets, doors and walls are covered with washable, wood-grained vinyl. Warm, bright colors cover the four-inch foam seat pads and the double mattress in the cabover bunk—which has windows on three sides. Roller shades mounted behind decorative valances shut out the sun.

Evidence of good planning is the water tank mounted next to the kitchen sink with special shelves for canned goods near it so this weight is placed low and amidships. Water-supply lines are short and can easily be drained when the vehicle is winterized. Cabinet doors swing up and lock in the open position. A small outside door with a lock at the right rear of the rig gives access to storage under the dinette seat that extends all the way to the sink so long skis or fishing rods can be stowed from outside.

The Ford 302-cu.-in. V8 engine with automatic transmission supplies adequate power and acceleration for this 6125-lb. rig with a GVW of 8300 lbs. Power steering, power brakes and cab-mount airconditioning are included. So are a comfortable reclining swivel seat for the copilot; a 40-gallon water tank, pressurized water system with water heater; a bath with recirculating toilet and medicine cabinet; three-burner range and oven; four-cu.-ft. gas/electric refrigerator; screens, screen door and bunk ladder; LP-gas space heater and twin gas bottles; two 12-volt batteries; a spare tire and wheel (extra on many motor homes); a wardrobe and generous storage cabinets.

The Ford-powered Shasta cruises well but noisily at 60-65. We tried to improve the sound-deadening of the motor shroud by adding more fiberglass insulation and covering its exterior with rubber-backed carpeting, but the best solution for easier conversation in the cab was to cruise at 50-55. Gas mileage on regular grade was 7-10 mpg; the lower figure was par for





MIRRORS on refrigerator and wardrobe doors add to a spacious feeling. Bath includes shower, lavatory



GALLEY has three-burner range, oven. Cabover bunk has a sturdy, color-schemed cover on foam mattress

turnpike speeds and pointed the need for a larger gas tank.

Acceleration is good on the level but falls off on long grades. The Chevrolet 350-cu.-in. engine delivers more power and is quieter and the motor shroud takes up less space in the cab. Braking requires a big foot for a fast stop; not the toe pressure of power brakes on a sedan. Chevy owners claim they are getting better braking and a better ride with the '73's heavier springing.

Like all motor homes, this 8-foot 11-inch-high vehicle is affected by crosswinds. This startles the new driver and often causes him to overcompensate. But wind gusts and buffeting from passing trucks have only a momentary effect and are best counteracted by riding them out with a steady wheel. However, in heavy rain when there is danger of hydroplaning as well as buffeting, the sensible driver will reduce his speed well below the legal limits.

What Shasta considers ideal equipment for this vehicle is essentially on target. Automotive airconditioning successfully cools the entire coach. (The center skylight is reinforced and wired to take a rooftop 110-volt cooler for those who need "air" when parked.) The gas-electric refrigerator is certainly "essential." People who

have traded up won't settle for an icebox. However, the brand Shasta chose is subject to frequent pilot-light blowouts caused by drafts while under way. This was the sole complaint of many owners we interviewed. Shasta has corrected it in '73 by changing to a 12-volt/110-volt compressor-type refrigerator as standard equipment. The change also includes a 108-amp. battery that will operate the refrigerator a full 24 hours without recharging.

We felt that another shortcoming of the early model was the lack of a lavatory in the bath. Shasta now includes that in the '73.

Although the 17-footer is rated as a six-sleeper, owners we interviewed agree that two of the six would have to be small children. But the Shasta sleeps four adults, or two adults (in the cabover) and three children (two on the convertible dinette and one on the lounge) very comfortably.

The ride—for the driver and copilot—is excellent; for those sitting in the dinette and on the lounge it's hard but not as harsh as in some dual-wheeled full-size motor homes.

The coach body extends six inches on each side beyond the cab (overall width, 7 feet 6 inches), but the driver soon gets

(Please turn to page 168)

It looks a bit odd, but boy how it flies!

Put wings on the nose, add a few other tricky touches, and you have a build-it-yourself two-seater with some amazing performance features

By **SHELDON M. GALLAGER**
and **HOWARD LEVY**
Photos by Henry Artof

IT TAKES OFF like an express elevator headed for the 65th floor and lands so nose-low you might expect it to plough into the ground—only it doesn't. Such are the remarkable capabilities of this strange-looking homebuilt with the equally strange name of VariViggen. However odd it may appear, its builder knew what he was doing. He's 28-year-old Burt Rutan, formerly a flight test engineer for the Air Force and presently director of development for Bede Aircraft—another revolutionary concept in

STUBBY NOSE WINGS, called canards, have hinged trailing edges that act like adjustable flaps for added lift and stability. The flaps are shown retracted at left, lowered at right. Unusual two-seater has twin tails, pusher prop powered by 150-hp engine





TWIN TAILS and swept wing give ship a racy look. Experimental wingtip fins have now been eliminated



HINGED NOSE COWL swings up for access to electrical equipment (upper photos). Nose wheel also retracts into space inside cowl. Cockpit layout (below) is like modern fighter's, with most controls on a side-mounted console near pilot's fingertips. Only flight gauges are on the front instrument panel



homebuilt design (see *Bede 5: Bullet-Nosed Beauty You Can Build Yourself*, page 174, Nov. '72 PM). Rutan spent seven years perfecting the VariViggen, and his efforts paid off. Its most distinctive feature is a pair of stubby nose wings called canards. These, plus a twin-tailed, modified delta main wing, give the little two-seater exceptional lift and control, eliminating the disadvantages of conventional deltas.

The normal delta has such a rapid sink rate at low speeds that it must land fast and at a sharp angle of attack to maintain adequate lift—often so nose-high the pilot has difficulty seeing the ground. By contrast, the VariViggen can amble in virtually flat—only a 3° angle of attack is required—and can touch down at speeds of less than 50 mph. Its tail elevators are electrically coordinated so they can be used either individually as ailerons or collectively as flaps. The nose-wing canards are also equipped with elevators so the ship has, in effect, four flaps—two forward and two aft. These together provide high lift at low speeds for short landings and takeoffs, making the craft spinproof, stallproof and a dream to handle—good news for the fledgling flier. The control surfaces are so precisely balanced that banking turns can be accomplished without using rudder control at all.

The basic principle behind the VariViggen's unusual configuration involves a mouthful of aeronautical jargon known as "complementary vortex interaction lift" with a side order of "wing reverse reflex and trim drag optimization." Boiled down, what it all means is that the canard and main-wing surfaces interact and complement each other to provide an airflow of maximum efficiency and minimum drag. In any single-wing system, wing design must represent a compromise to suit a variety of flying conditions. With two wing systems, each helps the other overcome inherent disadvantages and can be varied to meet changing conditions with less compromise in efficiency. Rutan explains the peculiar name as "Vari," after the system's variable features, and "Viggen," after the Swedish word for a similar canard-wing configuration used in the Saab 37 fighter and other Swedish aircraft.

Rudder control is not needed because of the craft's twin tail arrangement. In conventional aircraft, the rudder is used to correct for "adverse yaw"—a tendency



BELIEVE IT OR NOT, this is a takeoff, not a landing approach—showing how steeply the VariViggen gets off the ground, using canards for added lift



REAR VIEW shows aft-mounted engine with pusher prop. Note rudder, one of two, in right tail fin. Side-hinged canopy swings up for access to cockpit

for the ship to swing away from the desired direction of roll because of outside air pressure against the vertical tail fin. In the VariViggen, adverse yaw does not occur because there are two tail fins placed outboard on the wings themselves. In a right roll, pressure increases on top of the left wing. At the same time, this creates a sideways pressure against the *inside* face of the left fin, forcing the tail around in the same direction as the turn. A similar effect occurs with the right tail fin in a left turn. Thus the VariViggen steers itself into a turn naturally without the need for rudder control under normal conditions.

In landing, the VariViggen will not stall out even in a full-stall attitude with the control stick pulled all the way back. In fact, Rutan claims you can fly it right onto the ground with the stick at full aft stop, using throttle only for flight path control. The main wing is actually more trapezoidal in shape than a delta, being blunt-tipped with a slot cut away between the vertical fins for the pusher-type prop. Small wingtip fins were initially added for stability, but were found to be unnecessary and have been discarded. The engine is a 150-hp Lycoming mounted backward in the tail slot. The craft has an empty weight of 950 pounds and a gross of approximately 1650. Overall length is 20 feet, with a cockpit height of 4 feet. The canards span 8 feet; main wings, 19 feet.

MAY 1973

Construction is mostly of wood, with the fuselage consisting of spruce longerons, plywood formers and a plywood skin. The canards are all wood, and the inboard sections of the main wings are wood up to the fins. The outboard sections are aluminum and fold upward just beyond the fins for easy storing of the craft. The fins are also wood, with hinged metal rudders.

Cockpit layout follows that of modern fighter design—there's no having to look or reach for controls normally used in flight. Trim, radio and intercom switches are located right on the control stick. Throttle is on the left near the pilot's left hand, and engine-starting and other controls are grouped on a handy console on the right, just under the pilot's right arm. This leaves the main instrument panel for flight gauges only—one of the most important of which is an angle-of-attack indicator as landings are made by watching attitude readings rather than airspeed.

Top speed, rate of climb, cruising range and other specific performance figures are not yet available as the craft is still undergoing tests. Eventually, its designer expects to offer plans to other homebuilders interested in producing their own Vari-Viggens.

For additional information, readers may contact Burt Rutan at Bede Aircraft, Inc., Newton Municipal Airport, Newton, Kans. 67114.

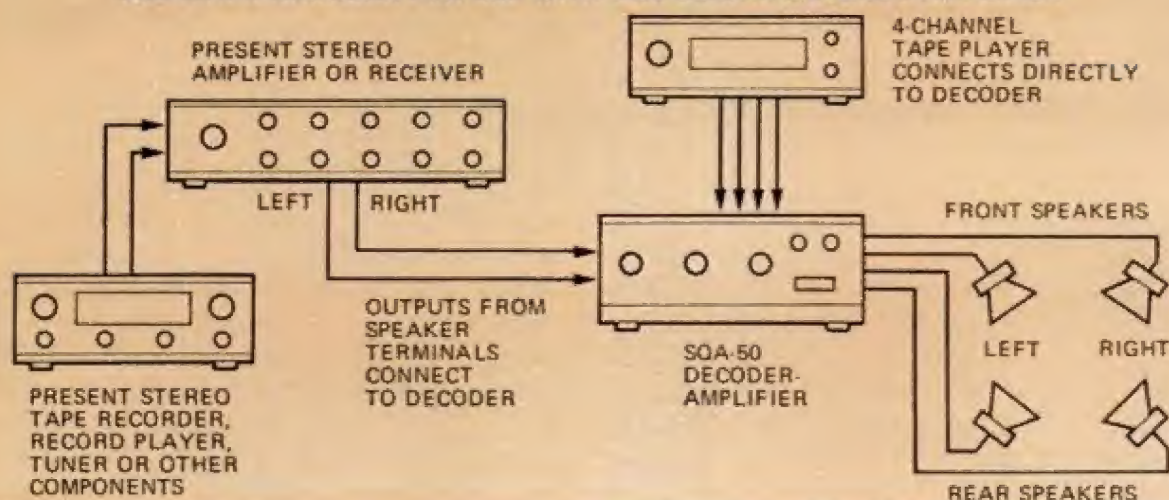
★★★

The new sound of SQ: Two easy ways to add it to your hi-fi

By SHELDON M. GALLAGER



AMPLIFIED DECODER FOR USE WITH ONE EXISTING STEREO AMPLIFIER



ONE OF SIMPLEST WAYS to add 4-channel SQ to an existing 2-channel system is with this Lafayette SQA-50 decoder. Unlike others, it does not require tape-monitor facilities, merely connects to speaker terminals on your amplifier. Photo at upper right

shows connections on rear panel. Middle two are inputs from your amplifier, while other four are outputs to feed four speakers—two front and two rear. Extra row of four jacks provides optional inputs for the direct connection of a 4-channel tape player

THE LATEST WORD in 4-channel sound is SQ—the new quadraphonic matrix system developed by Columbia that's fast showing up in a number of SQ-encoded records and SQ broadcasts on FM-stereo radio. Until recently, equipment sold for decoding matrixed recordings did not incorporate SQ circuitry. So if you don't yet have 4-channel sound, or if you have it but with one of the earlier non-SQ decoders, here are two simple, inexpensive add-ons for updating your

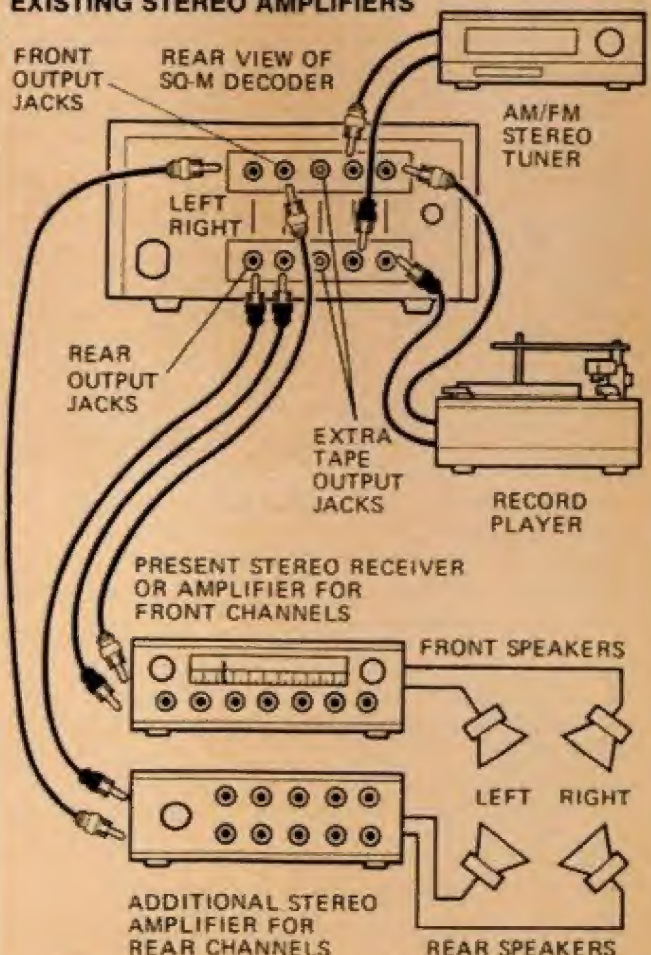
present hi-fi to the new Columbia system.

Both units are sold by Lafayette Radio and both are compatible with other matrix systems besides SQ. While they are by no means the only SQ decoders on the market, they share one distinctive feature that makes them unique—neither requires tape-monitor facilities for connection. Thus they aren't limited to equipment providing tape-monitoring facilities, generally found only in the higher price class. They can be hooked easily to just about any



NONAMPLIFIED DECODER is inexpensive way to get SQ if you already have a stereo receiver and amplifier or two stereo amplifiers. Decoder connects to auxiliary inputs if tape-monitoring facilities do not exist. Supplementary components such as tuner,

NON-AMPLIFIED DECODER FOR USE WITH TWO EXISTING STEREO AMPLIFIERS



record player and tape deck must be connected directly to the decoder so their signals feed through decoder's SQ circuitry. Jacks on rear panel (photo at lower left) provide necessary inputs for this. Price of Lafayette's SQ-M model shown is \$44.95

piece of stereo equipment, even a table-model FM-stereo radio for SQ broadcasts.

Two models are available, one with built-in amplification and one without, depending on what equipment you already have. Lafayette's SQA-50 is a combination decoder/amplifier that's simple to attach and requires only one existing stereo amplifier or receiver and a pair of extra speakers to put you in business. It incorporates not only the two additional channels of amplification needed for rear

speakers, but actually provides a total of four separate amplified channels. While output power is modest—three watts IHF per channel—it's adequate when used with your present stereo system.

The SQA-50 also offers a valuable bonus: Its four channels of amplification enable you to play 4-channel tapes without having to invest in a second stereo amplifier. Any accessory 4-channel tape deck—8-track cartridge or reel-to-reel—can be used with the decoder. It simply plugs

into connections on the back, feeding your four speakers directly through the decoder. Thus you can have discrete 4-channel sound from tape or decoded SQ from records and broadcasts—all in one tidy package. In addition, the SQA-50 provides "derived" 4-channel effects from regular 2-channel sources through a special "composer" circuit altering speaker phase relationships to simulate quadraphonic sound.

Unlike other decoders, the SQA-50 takes its input signals right from the speaker output terminals on your receiver or amplifier. This is why no tape-monitoring facilities are required. Your existing

stereo speakers provide left and right front-channel information, while the two new ones add left and right rear channels. This creates the rich, room-filling, concert-hall effect of quadraphonic sound. If your amplifier offers remote speakers, these can be left connected for enjoying conventional stereo in other rooms.

The SQA-50 features front-panel jacks for 4-channel headphones, balance controls for both front and rear speakers, and a mode selector that lets you choose SQ 4-channel, discrete 4-channel or derived 4-channel at the twist of a knob. It's \$49.95 from Lafayette Radio, 111 Jericho Turnpike, Syosset, N. Y. 11791. A 4-channel cartridge tape player, Model RK-84, is available from Lafayette for \$69.95.

The second decoder, Lafayette's Model SQ-M, is a smaller, less expensive non-amplified type designed for use with an existing 4-channel amplifier or two 2-channel amplifiers. It's particularly handy for adding SQ circuitry to earlier-model amplifiers and decoders that lack SQ. Like the SQA-50, it does not require tape-monitor facilities, although it can be connected to them where such facilities exist. Where they don't, you use your auxiliary input jacks. Your speakers remain connected to the original equipment—two for left and right front from one amplifier and two added speakers for left and right rear from a second amplifier, receiver or non-SQ decoder. Accessory components such as a tuner, tape player or phonograph must be plugged directly into the SQ-M decoder, however, so their signals feed through the decoder's SQ circuitry. Jacks on the back are provided for this purpose.

As with the SQA-50, the SQ-M offers a choice of switch-selected modes—SQ 4-channel, derived 4-channel or a simple paralleling of front and rear speakers to feed a 2-channel source through all four speakers. You can also select one of two inputs from the front panel—either phono or tuner. An especially welcome feature is a master volume control that lets you adjust overall sound level without disturbing individual left to right and front to back balance settings. The SQ-M is priced at \$44.95. There are other, more sophisticated decoders, and in a future issue PM will report on these, too. But for the moment, the SQ-M and SQA-50 models offer an easy way to get started in SQ at prices equally easy on the pocketbook. ★★★



FOR QUAD ENTHUSIASTS who want to go all the way, here are two new developments that represent the ultimate in 4-channel convenience and flexibility. Above is Lafayette's 4-channel AM/FM/SQ stereo receiver, first of its type to incorporate built-in full-logic SQ decoding along with four separate channels of amplification. In addition to SQ, the powerful 300-watt LR-4000 reproduces discrete 4-channel, derived 4-channel and regular 2-channel. Price is \$499.95. Below are two companion TEAC units—the top one a 4-channel Dolby noise suppressor for simultaneous recording and playback of 2 or 4-channel material, and the bottom one a 4-channel mixer with six mike and line inputs. The AN 300 Dolby unit is \$439.50, while the AX 300 mixer is \$299.50





New calculator kits: From pocket minis to versatile desk models

By IVAN BERGER
Electronics Editor

Photos by Peter Schneider



KEYBOARD on Aries AR-420 (above) is thin, pressure-sensitive panel with no keys or key travel; printed insert sheet and holes in case guide fingers. Constant switch, uniquely, works on addition and subtraction, not just on multiplication and division. Shown at top is Heath's first pocket calculator kit

CALCULATORS are popping up all over—and not just as finished products, but, increasingly often, as kits. We've built three (the Heathkit IC-2008, now replaced by the IC-2108; the Aries AR-410, and the MITS 1440), and used two more (the Aries AR-420 and the MITS 1212). We're impressed by the values.

Pocket calculators, for example, are available for as little as \$49.95 in kit form (the MITS 1206, with decimal control). Desk calculator kits run the gamut from Heath's basic \$79.95 IC-2108 with extra-large



MIRROR shows undersides of MITS 1212 keyboard and circuit board. Single IC chip does all calculations, simplifying layout—but fine soldering is required

digits for easy reading to the MITS 7400 series (\$299.95 to \$339.95) with even more features for scientific and engineering calculations than the remarkable \$399.50 Hewlett-Packard HP-35 (though they lack the HP's amazing portability).

If you don't need the 7400s' versatility in a wide range of geometric, trigonometric, logarithmic and other complex calculations, you may want the square root capability of the MITS 1440 (or the less



MITS pocket calculator (left) has more satisfying keyboard feel than Aries (right), but the latter is smaller, more versatile, has more readable display

direct, but still quick, square root capability of the Aries AR-420), or versatile memory registers of MITS 1240 and 1440.

Building the kits is simple, since many connections are repeated several times. Figure on an evening or two on simpler kits, and over 12 hours for complex ones.

For further information, write: Aries, Box 808, Peabody, Mass. 01960; Heathkit, Benton Harbor, Mich. 49022; MITS, 5404 Coal Ave., Albuquerque, N.M. 87108. ★ ★ ★

COMPARISON TABLE—CALCULATOR KIT PRICES, BASIC FEATURES

Make and Model	Kit Price	Assembled Price	Display Digits	Memories	Decimal Settings	Special Features
Pocket Calculators						
Aries AR-420	\$ 75.00	\$ 99.00	8	K	Floating	Flat keyboard ¹ . A.c. opt., \$17.50 with rechargeable batteries. Very compact.
Heathkit IC-2009	92.50	N.A.	8	K	Floating	Modular construction, battery-saver shut-off, low-battery indicator A.C. and rechargeable batteries supplied.
MITS 1206	49.95	59.95	6	None	Preset, 2 or 4	A.C. opt., \$6.95. Battery-saver shutoff.
MITS 1209	69.95	89.95	9	None	Preset, 2 or 4	A.C. opt., \$6.95. Battery-saver shutoff.
MITS 1212	89.95	99.95	12	None	Preset, 2 or 4	A.C. opt., \$6.95. Battery-saver shutoff.
Desktop Calculators						
Aries AR-410	99.00	N.A.	8+8 ²	K	Preset, 0-7	Optional clock converter, \$20 (\$25 if purchased separately).
Heathkit IC-2108	79.95	N.A.	8	K	Floating and preset	Decimal setting preselected during assembly. Extra-large 1/2" readout digits.
MITS 1230	89.95	99.95	12	None	Preset, 0-5	
MITS 1240	119.95	149.95	12	M(4-key)	Preset, 0-5	
MITS 816	159.95	189.95	8+8 ²	K	Preset, 0-7	
MITS 1440	199.95	249.95	14	K, M(4-key)	Preset, 0-7	X ² , √ ¹ x, exchange.
MITS 7400A	299.95	379.95	10+2-digit exponent	2M, 3-stack	Floating	X ² , √ ¹ x, x y exchange, trig functions, π, log and ln, polar, radians, e ^x , 1/x, roll ¹ , backspace.
MITS 7400B	319.95	399.95		2M, 5-stack	Floating	
MITS 7400C	339.95	419.95		2M, 7-stack	Floating	

Footnotes, abbreviations: ¹See photo, page 151; ²Displays 16-digit results, 8 at a time; N.A., not available; M, memory with individual entry; K, constant memory—holds constants for multiplication, division (also addition, subtraction in Aries AR-420); Stack, holds number of entries shown in sequence, for recall, reuse; Roll, recall key for entries in stack.

Popular Mechanics Car Care Guide

■ **ENGINE TUNE-UP—**
Ignition system
Electrical system
Charging system
Fuel system
Emissions control
Timing

■ **LUBRICATION**

■ **COOLING SYSTEM**

■ **BRAKES**

■ **SUSPENSION AND
STEERING**

■ **TRANSMISSIONS**

■ **TIRE CARE**

■ **BODY CARE**

■ **PLUS** other know-how
you need to keep
your car in perfect
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Popular Mechanics Car Care Guide



SECTIONS

- 1 ENGINE TUNE-UP**
- 2 LUBRICATION**
- 3 COOLING SYSTEM**
- 4 BRAKES**
- 5 SUSPENSION, TIRES AND STEERING**
- 6 BODY CARE**
- 7 PLUS other know-how you need to keep your car in perfect condition**

Illustrations by
ROY GRINNELL

Cover design by
DALE GUSTAFSON

Popular Mechanics Car Care Guide



1 ENGINE TUNE-UP

Tune-up keeps an engine running smoothly and economically, helps curb pollution, and uncovers hidden problems. A tune-up should be done at least every 12 months or 12,000 miles, whichever occurs first. The sequence of services suggested here will allow you to touch all bases.

In our presentation of procedure for you to follow, we sometimes show what you may regard as expensive or "exotic" tools. With a modern automobile they are necessary and their cost is low when spread over future work you'll be able to do yourself. The right tools and instruments make your work simple.

For some work, very expensive professional tools have to be used and you will have to seek the services of a professional mechanic.

The overall purpose of *Car Care Guide*, therefore, is twofold: (1) to help you to do yourself as much maintenance and service as possible, and (2) to make

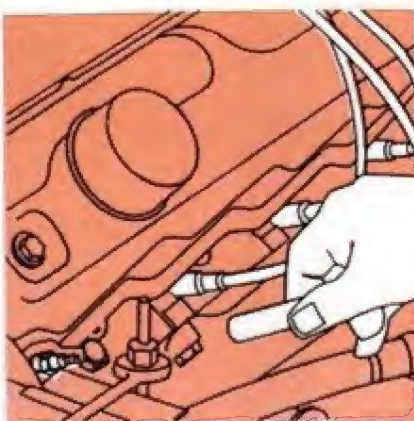
you well enough informed to see that whatever work you leave to a professional mechanic is done properly.

Compression Test

Tune-up cannot compensate for the inefficient performance resulting from low or uneven compression. If an engine idles rough because of a sticky valve, tune-up will not smooth out idle. So, if you have any doubt, take a compression reading on each cylinder.

You will need a compression gauge. This instrument, as well as other tools and supplies mentioned in this booklet, can be obtained from a local automotive parts and accessories dealer.

After warming up the engine (so the choke plate is wide open for the test), disconnect sparkplug wires by grasping and twisting boots—not wires. Pulling on wires causes separation, which leads to disruption of ignition current and misfiring.

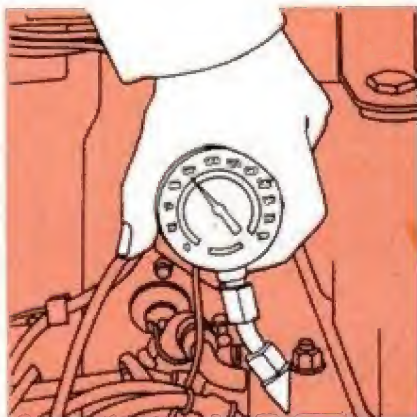


As you disconnect each sparkplug wire, mark the wire and plug so you can reconnect them properly later on. Wires may be identified by attaching adhesive or masking tape to

them on which you've written the cylinder number. Use tape or a felt pen to mark the same number on plugs.

Blow particles from sparkplug ports (a syringe makes an excellent tool). And make sure nothing falls into cylinders as you remove plugs.

Take a compression reading of each cylinder as someone holds the gas pedal to the floor so a full fuel-mixture charge is present in the cylinder. Crank the engine through enough compression strokes to assure the highest reading.



As you take each reading, make a note of it. Compare readings. If the lowest reading is less than 80 percent of the highest reading, a sticky or burned valve probably exists at that cylinder. Less than allowable minimum compression in an engine that's been using oil indicates worn rings.

Obtain standard and minimum compression specifications for your engine from the service manual, from the service department of a dealer who sells your make of car, or from a general automotive reference manual which is available in most public libraries.

Sparkplug service

Although new sparkplugs are recommended every 12,000 miles, old ones may be used for many more miles if not damaged or badly worn. Clean old plugs by scraping deposits from lower insulators with a hacksaw blade you've ground to a point at one end.

Use an ignition file to get electrodes smooth and bright. Reset electrode gap with a sparkplug feeler gauge to the specification given in your owner's manual or on the vehicle emission-control label mounted near or on the radiator.



Use the bending-tool end of the feeler gauge to bend the ground electrode. Don't use pliers or bend center electrode; you'll ruin the plug. If you're installing new plugs, set the gap. It's not done at the factory.

Carefully clean sparkplug port threads with a small wire brush coated with grease to pick up deposits.

Some plugs have tapered seats and need no gaskets. If gaskets are used, get new ones. Set plugs into ports by hand, taking care not to cross thread. When hand-tight, seat plugs firmly, but not too tight.

Ideally, use a torque wrench to tighten them to the manufacturer's specs—from 15 to 21 ft.-lb. Check the manual or a dealer.

Check plug wires and boots to see if they're cracked or brittle. Replace if they are. Push wire terminals firmly on plugs.

Battery service

Use a hydrometer to test battery specific gravity, which is the percentage of sulfuric acid to be found in the electrolyte. Draw electrolyte into a clean hydrometer tube from one cell, record the reading and return the electrolyte to the same cell. Repeat the operation for each of the other cells.



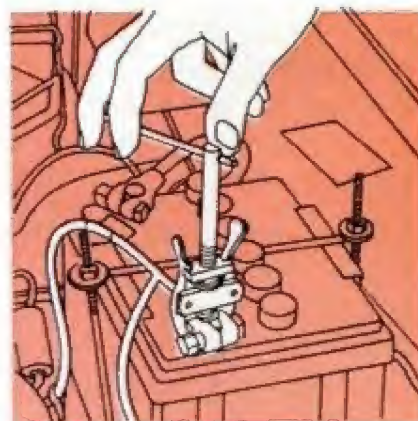
There are many inexpensive hydrometers on the market. The best have a built-in temperature compensator since temperature affects specific gravity. To stabilize the instrument, let electrolyte set for a minute before reading. When reading, make sure float rides free and hold hydrometer at eye-level.

Specific gravity of a fully charged battery is 1.260-1.280. If you get an overall reading of 1.230 or less,

charge the battery. The slower the charging rate the better. If specific gravity doesn't increase, the battery's just about had it.

Compare each specific gravity reading with the others. A variation of .050 or more points indicates a weak cell or cells. The battery may still be usable for months, but check it more often so you're not caught with a dead battery.

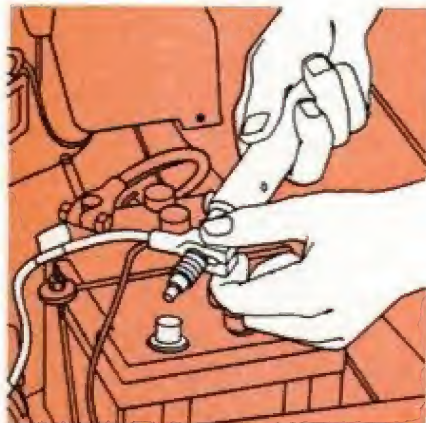
Remove it for cleaning by taking off the ground cable (negative in most cars) and then the "hot" cable. To avoid damaging the posts, use a battery terminal puller instead of a screwdriver or pliers to lift terminals.



Clean batteries periodically to prevent discharge and prolong life. Tighten vent caps and cover them with strips of masking tape to keep the cleaning agent, which will neutralize acid, out of the battery. Scrub the case with ammonia-water or baking soda-water solution, then flush with plain water. Repeat until an application of agent fails to fizz.

Before reinstalling the battery, wash the battery holder with cleaning solution and examine battery cables,

which should be replaced if damaged. Clean corrosion from terminals with the wire-brush end of a battery cleaning tool.

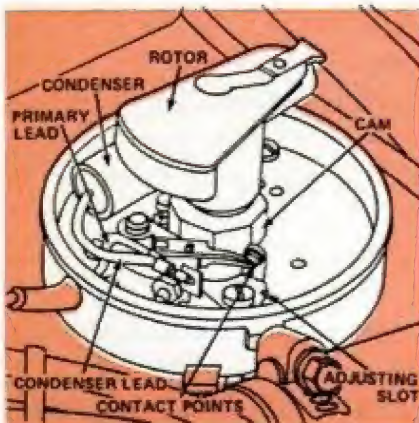


Reconnect the "hot" cable (the positive cable in negative-ground cars) first—then the ground cable. Draw terminals tightly to posts and apply a thin coat of petroleum jelly to help retard corrosion.

Ignition service

Start ignition service at the distributor. Remove sparkplug wires from distributor cap towers and mark them for identification as you did for the compression test. Each wire must be returned to the tower from which it was taken.

Remove the distributor cap, wipe it clean and inspect it inside and out for hairline cracks, carbon



tracks, and burned or corroded terminals. Damage usually means that terminals hadn't been making good contact and arcing resulted. Replace cap if damaged. If not, clean out particles from the inside towers.

Test the distributor's internal condition by turning the rotor as far as possible and releasing it. It should snap back to its original position. If not, check condition of springs and internal parts and repair them as necessary.

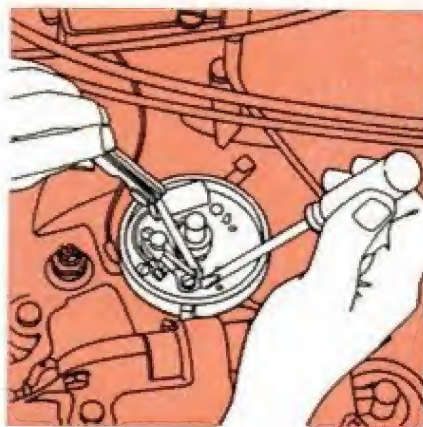
Pull off the rotor and inspect it for a corroded or broken metal contact and cracks. Replace a damaged rotor. Spread apart the distributor contact points carefully and examine them. Points that have an overall gray color and are slightly rough or pitted can be kept in use. Replace badly burned or pitted points but first find out the reason for the damage and repair it.

Points usually burn or pit because of an improperly adjusted or inoperative voltage regulator or ballast resistor; a defective or incorrect condenser, or high resistance in the condenser circuit; oil or vapors that get into the distributor because of a clogged engine breather; excessive lubricant tossed off by the distributor cam and picked up by the points; weakened contact-point spring; and incorrect gapping of points when originally installed or last worked on.

If points are in good shape, clean off scale by passing a clean fine-cut contact file between them a

few times. Do not use emery cloth or sandpaper.

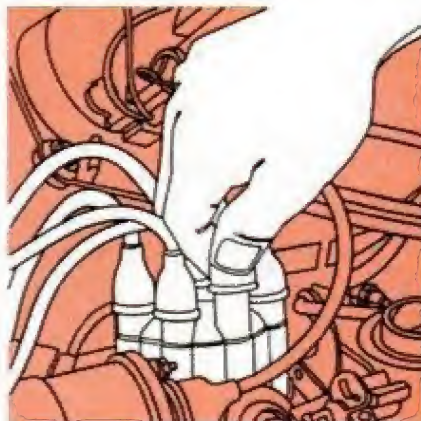
Set the breaker-arm rubbing block on the high point of a cam lobe and adjust the contact-point gap with a flat feeler gauge to the specification given on the vehicle emission-control label or in the



owner's manual or in a general auto-repair manual.

If the distributor is equipped with a wick-type cam lubricator, replace it. If there is no built-in cam lubricator, then apply distributor-cam lubricant in a drop about the size of a match head to one cam lobe.

Reinstall the rotor and distributor cap, and seat each sparkplug wire firmly into its respective tower by pushing down the boot



while squeezing it to release any trapped air.

HEAVEN ONLY KNOWS HOW OFTEN YOU SHOULD CHANGE YOUR OIL.

First it was every thousand miles. Then somebody said every fifteen hundred. Then somebody else told you six thousand. It depends on who you ask. And it's enough to confuse anybody.

There's no absolute rule to how often you should change your crankcase oil. The time of year and climate have a lot to do with it. But don't leave it to heaven. There's a lot at stake, and a lot to know.

Your driving habits can be a factor. Oil should be changed more often under conditions of extensive idling, trailer pulling, driving in dusty conditions, and short trip operation at low temperatures.

So even though we've been in the gasoline and oil business for so many years, even we can't give you a simple answer.

We do recommend an oil change at least every 3000 miles or 3 months; but you should never exceed the automobile manufacturer's recommendation.

You should also read your owner's manual very carefully. Especially the fine print, which might reveal some exceptions according to your climate and driving practices.

If you still can't determine how to change your oil, bring the manual and the car to your mechanic. He changes a lot of oil in your area for people who probably have the same driving habits and type of automobile as yours.

Of course, we hope the dealer you bring your car to is a Gulf dealer. He'll be glad to help you learn about that, and anything else you'll like to know about your automobile.

You can also send your questions direct to Gulf Consumer Information, Box 1519-H, Houston, Texas 77001.

You see, we'd like you to learn all you want to know about your car. And our products. That way we can keep you on the road. And us, too.

GET TO KNOW GULF AND YOU'LL GET TO KNOW YOUR CAR.



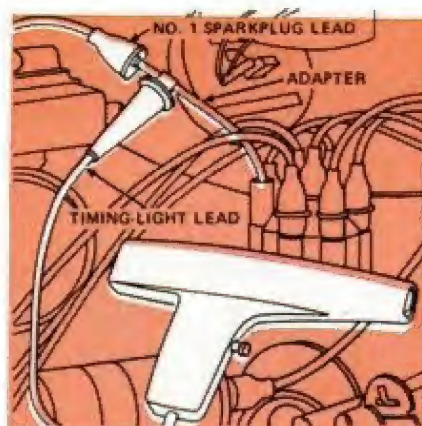
GULF OIL CORPORATION

Clean out the high-tension lead tower of the ignition coil and make sure that the high-tension lead is seated firmly in the coil tower. Also tighten the ignition primary wire connections on the coil.

If you have a dwellmeter, set the contact-point dwell angle to the specification given on the vehicle emission-control label or in other service literature. If you don't have a dwellmeter, but the distributor cap is equipped with an access cover, you can allow the engine to idle, raise the access cover, and turn the contact point adjusting screw until the engine just starts misfiring. Then turn the screw back one-half turn to complete this "by-ear," approximate dwell adjustment, and make sure that the access cover is closed tightly so dirt can't get inside the distributor.

Timing ignition comes next. It requires the use of a stroboscopic timing light and tachometer. The timing

connect a tachometer, and set idle speed to specification. Connect the timing light to No. 1 sparkplug circuit, but do not puncture



the sparkplug wire to obtain metal-to-metal contact. Instead use an adapter.

Disconnect the hose from the vacuum advance control unit on the distributor and plug the end of the hose with a pencil so that no vacuum leak will exist to throw the timing out of whack. After the engine is warm and at specified idle, aim the timing light at the appropriate timing mark and pointer. Sight straight down the center of the light. Don't tilt it.

The engine is timed correctly when the flashes of light blipping from the timing light "freeze" the timing mark in relation to the pointer. In other words,

you should not see the timing mark shifting.

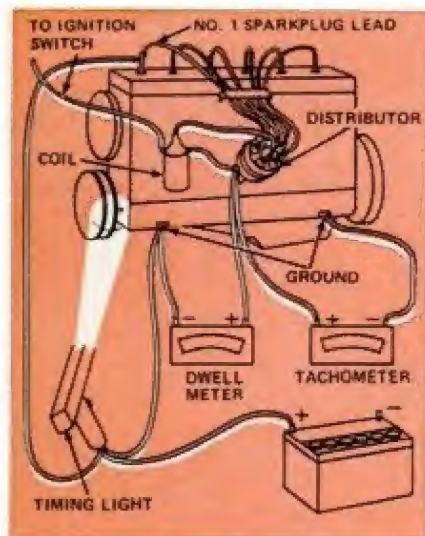
If timing is not set to specification, loosen the bolt holding the distributor housing and rotate the distributor until the timing mark lines up with the pointer and holds steady. If turning the distributor in one direction doesn't bring the timing mark closer to the pointer, turn it in the other direction. Tighten the distributor housing and recheck timing.

Now test the performance of the vacuum advance unit by removing the timing light from the No. 1 cylinder and connecting it to the alternate firing cylinder. On V8 engines, this is the fifth cylinder in the firing order. On six-cylinder engines, it's the fourth cylinder in the firing order. Check your service data to determine the firing order.

Check timing. A 3° difference in timing between the two cylinders (No. 1 and the alternate firing cylinder) is acceptable. Any greater variation is an indication that distributor wear exists and the unit should be repaired.

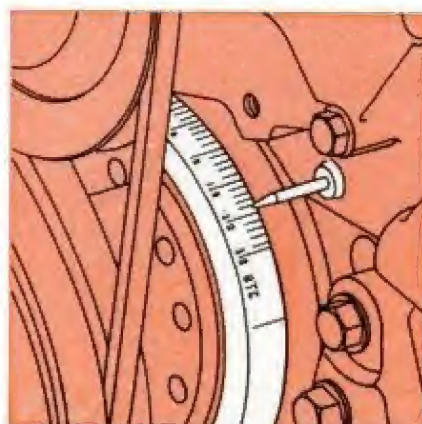
Now hold the vacuum advance hose near the vacuum advance unit, and have someone in the car gradually increase the engine speed as you push and pull the hose on and off the unit.

The timing mark should shift rapidly if the advance unit is working properly. If the timing mark doesn't move or moves sluggishly, the diaphragm in the vacuum advance unit has ruptured. Replace the unit.



specification is provided on the vehicle emission-control label and in service books.

Warm up the engine,





We ran one of the toughest rallies in Europe on passenger car tires.

The Rally of the Acropolis, 1972. So tough that 98 cars started, and only 14 finished. But this Datsun came through near the top on Sears Steel-Belted Radials. (Tires were changed in accordance with rally procedures.)

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For more details and official FIA rally results pertaining to Sears tires, write Sears, Roebuck and Co., Dept. 695, 303 East Ohio, Chicago, Illinois.



Two Steel belts Radial design



Sears Steel-Belted Radial.

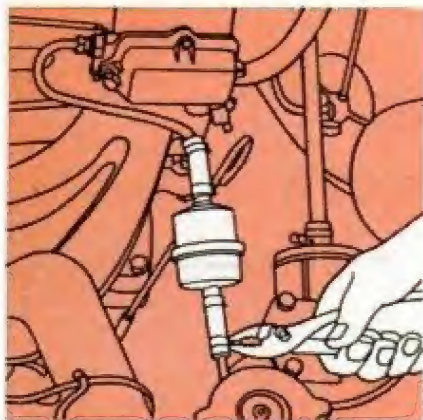
Proven for toughness, traction and mileage on the tough roads of the world.

Fuel system service

If cylinders don't receive a properly proportioned fuel mixture because of a malfunction in the fuel system, the engine will be hard to start, will miss and stall, and will use more gas than necessary.

Begin fuel-system service by checking the carburetor air filter. Follow your owner's manual for the maker's recommendations regarding replacement.

Manufacturers generally recommend that you replace the fuel filter at tune-up time on the chance that it may have gathered foreign matter that is impeding the flow of fuel. Your engine has either an external fuel filter on the fuel line between the fuel pump and carburetor, or an integral filter at the entrance to the carburetor fuel bowl.

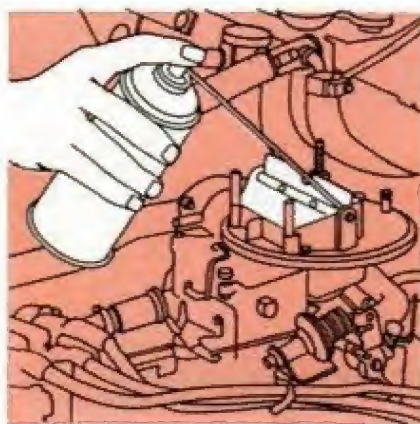


To remove an external filter, slip the clamps off the line. To get at an integral filter, remove the fuel line at the carburetor. This filter is spring-loaded. You'll want to reuse the spring—don't lose it.

After servicing filters, check the automatic choke. Press the gas pedal to the floor once. The choke

butterfly plate should close over the carburetor throat. Start the engine. The plate should open gradually and be wide open when the engine's warm.

If the choke isn't working efficiently, dirt is probably hampering choke linkage and/or the butterfly plate operation. Clean off the linkage and plate pivots with a choke cleaner. Don't lubricate any part of the choke system. Lubricant



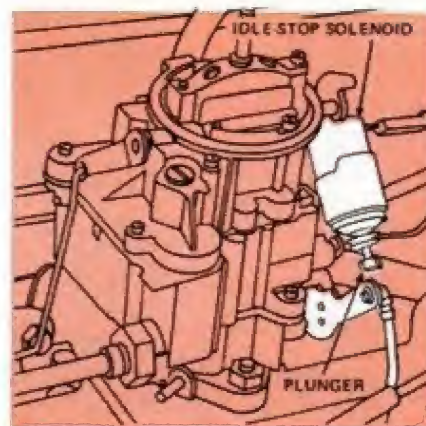
attracts dirt, which will cause the choke to stick.

Recheck choke plate functioning. If it's still not working, a part such as a thermostatic spring, choke piston or electric assist element has weakened and should be replaced.

Since 1968, many carburetors have been equipped with an idle-stop solenoid that prevents engine run-on by allowing the throttle to close completely as soon as the ignition is turned off. Sometimes this condition of an engine continuing to chug after the ignition key is switched off is called dieseling.

Check the functioning of the idle-stop solenoid by seeing if the solenoid's plunger is resting against the throttle-plate lever as

the engine idles. Shut off the engine. As soon as you do, the plunger should retract, which allows the throttle valve to close. If the idle-stop solenoid doesn't operate this way, it has failed and should be replaced.



The idle speed of an engine that is equipped with an idle-stop solenoid is set by turning the plunger until a tachometer records the specified idle rpm. If the carburetor is not equipped with an idle-stop solenoid, idle speed is adjusted by turning the idle-speed adjusting screw.

In any event, to set idle speed, the engine has to be warm, the handbrake set and a manual transmission in *Neutral* and automatic transmission in either *Neutral* or *Drive*, depending on which specs you choose to set to.

The idle mixture of all engines since 1968 has been factory-set to Federal standards. Idle-mixture screws are locked with caps that should not be tampered with. This is the law.

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**If you care for your car...
Simoniz® has everything you need.**



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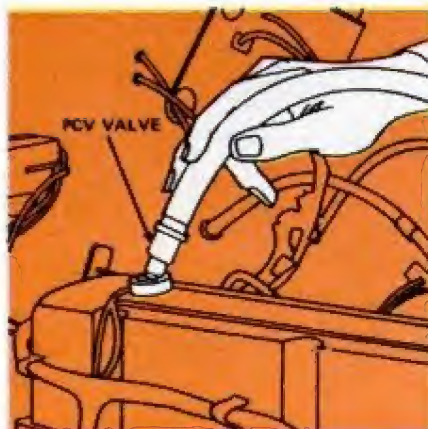
Parts that fight pollution

Engines may have three separate systems to combat pollution. All models since 1963 have a crankcase emission-control system that directs crankcase vapors into the combustion chambers for burning. This system uses a PCV (positive crankcase ventilation) valve.

Since 1968, cars have been equipped with an exhaust emission-control system that strives for more complete burning of fuel. The most recent addition is exhaust gas recirculation (EGR), which has been incorporated in 1973 models to help retard oxides of nitrogen.

The evaporative emission-control system was introduced in 1970 to help trap fuel vapors before they could get into the air.

Start servicing with the crankcase emission-control system. Pull out the PCV valve. In V8s, the valve is usually located in the push-rod cover. In six-cylinder engines, it's in the rocker arm cover.



Although the PCV valve should be replaced every 24,000 miles, its performance should be checked at every tune-up. Cover the

valve with your thumb as the engine idles. You should feel a strong pull. If not, replace the valve and examine the rest of the system.

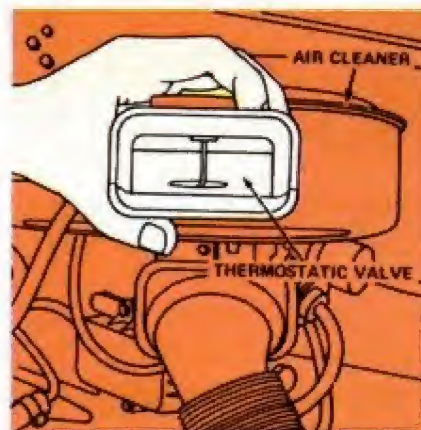
Inspect PCV valve hoses for deterioration. If your car is a 1966 or later model, there's also a hose from the carburetor air cleaner to the rocker arm cover that should be looked at. If new hoses are needed, get those that are gas and oil-resistant.

Another component of many crankcase emission-control systems is a cotton or mesh-type filter in the carburetor air cleaner into which the PCV hose leads. Some are an assembly (filter and holder), while others are only a filter. Tap or shake this element. If dust falls out, replace it.

The exhaust emission-control system consists of a temperature sensor, damper valve and hoses. Components are contained in the carburetor air cleaner.

Check hoses for kinks, holes and looseness. In most setups, one large-diameter hose is connected to the air cleaner snorkel and a smaller-diameter hose leads from the temperature sensor to a source of manifold vacuum.

With the engine cold, look into the snorkel's mouth. Start the engine. The damper valve should close fully over the snorkel. As the engine gets warmer and warmer, the valve should open more and more until it is fully opened when the engine reaches normal operating temperature.



If your system doesn't work this way, the valve control or the temperature sensor is faulty and repairs should be made. But first test the operation of the manifold heat-control valve, which has a direct effect on the operation of the damper valve in the snorkel.

The only maintenance required on the evaporative emission-control system is the replacing of a filter in the base of a carbon canister of those cars that use canisters. Most do.



Other tune-up services

● **The manifold heat-control valve** is a thermostatically controlled device in the exhaust manifold that helps a cold engine warm up by closing off the manifold and trapping hot exhaust gases. These gases circulate, aiding rapid warm-up. But as the engine warms up, the valve opens and gases escape. If they remained trapped, overheating and blistered sparkplugs would occur.

Not every engine has a manifold heat-control valve. To check, reach below the exhaust manifold to see if there is a counterweight; It is part of the valve assembly. The valve itself is inside the manifold.



Try to move the counterweight. If it's stuck, the manifold heat-control valve is not operating. Apply a manifold heat-control valve lubricant liberally at the counterweight pivot and, if necessary, tap counterweight lightly with a mallet. The valve should free itself; if not, the assembly should be replaced. To keep this valve working, apply lubricant when you grease the chassis.

● **Drive belts** should be in-

(Please turn to page S16)

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We're the great unknown. Which is rather unfortunate for you and for us because we happen to make very fine pickup trucks.

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Once you drive The Other Pickup you'll discover that we have a nice, smooth ride.

And we handle beautifully.

And we have a long list of options. Including automatic

The Other Pickup.



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And you can have your choice between torsion bar and leaf spring suspension.

And we have some great safety features like a collapsible steering column, a fuel tank outside the cab and an anti-skid system available on two models.

So what's the big difference between Ford, Chevy and The Other Pickup?

None that we can see. But you'll want to see for yourself at your International dealer. You might decide that The Other Pickup is really the Only Pickup.



International. The Other Pickup.

spected for wear, damage and glaze. Replace a bad belt. Also check belts for tension. It is most accurate to use a drive-belt tension gauge.

If a drive-belt tension gauge isn't available, press in on belts with your thumb midway between pulleys. If a belt "gives" no more than 1/2 inch under heavy pressure, you're okay.

Tension specifications vary from engine to engine, so check your service literature.

To tighten drive belts, bring pressure against the center of the alternator or airconditioner compressor, depending upon the belt, and run up bracket nuts.

● **Charging system problems** can be many, but often the trouble is nothing more than a loose belt. So, when

insufficient charging rate is indicated on your ammeter or by your idiot light remaining lighted, check belts first. Also check for clean and tight battery connections. Too great a charging rate is indicated by your battery needing water more often than usual.

When overcharging is the problem, check alternator or generator and voltage regulator.

● **Air leaks** at the base of carburetor, and between intake manifold and head can cause a loss of vacuum that will defeat the purpose of engine tune-up. Spread heavy oil around these areas and start the engine. If there's an air leak, oil will be sucked into the engine. You will see it. Tighten all bolts and test again. If you

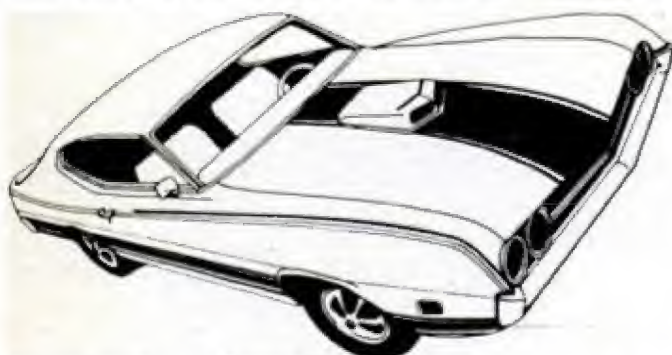
get the same result, the gasket is probably bad and should be replaced.

● **Road test.** The real trial for engine tune-up comes when you get on the road. Operate at low speed and at a constant highway speed.

Vary speed on the highway, accelerating rapidly and dropping back quickly. Accelerate slowly from a dead stop and accelerate quickly from a dead stop.

If the engine performs flawlessly, your tune-up is a success. But if it misses, stalls, surges, accelerates poorly (flat spots, for example), recheck what you have done. If this shows that tune-up was indeed done properly, then your engine problems are more than can be corrected by a simple tune-up.

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Popular Mechanics Car Care Guide



2 LUBRICATION



Oil and oil filter

Manufacturers differ about the time to change your oil and oil filter. Check your owner's manual or other data. Changing oil and filter as recommended assures enduring engine performance in the least expensive way.

To meet today's arduous driving conditions, modern engines should be fed oil meeting the API (American Petroleum Institute) rating "SE." This symbol appears on oil cans singly or in conjunction with other symbols. "SE" engine oil gives maximum protection from high-temperature engine deposits, oil oxidation, rust and corrosion.

Use either multiviscosity or single-viscosity oil from a reputable oil company. Multiviscosity oil covers a wider operating-temperature range. Determine specific oil viscosity by the lowest air temperature anticipated before the next oil change. Use this chart as a guide:

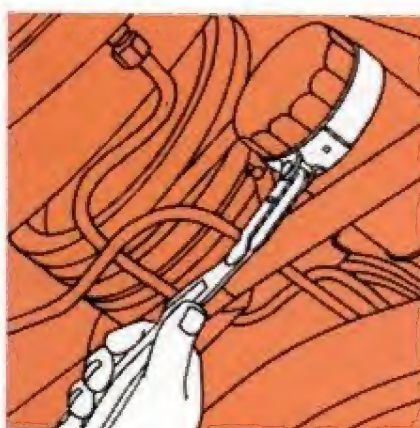
Temperature	Oil Viscosity*
Above 0°	MV 10W-30 or 10W-40
Below 0°	MV 5W-20 or 5W-30
Above 32°	SV 20W-20
Below 0°	SV 10W†
to +32°	

*MV: Multiviscosity

SV: Single-viscosity

†Avoid sustained driving above 65 mph

To change engine oil, place a pan under the rear of the oilpan and remove the drain plug with a correct-size end wrench or socket wrench. As oil drains, put a pan under the oil filter and remove the element (most turn counterclockwise). If you can't loosen it by hand, you'll need an oil-filter strap wrench. Clean filter seat on the cylinder block with a clean cloth.



Coat the gasket of a new filter with clean engine oil. Be sure to buy the correct filter for your engine—check your automotive parts and accessories dealer.

Carefully screw filter back on and turn it by hand until

tight. Don't use the oil-filter wrench. Clean oilpan drain plug and replace its gasket if damaged.

Install the drain plug back into the pan and torque it to 15 to 20 ft.-lb. If you don't have a torque wrench, tighten the plug by hand and give it one-half turn with a wrench.

Fill the crankcase with fresh oil after determining how much oil is required (with filter) by consulting the owner's manual or other service literature. This will vary from four to seven quarts, depending on the engine. Do not overfill. After the crankcase is filled, check the oil level.

Start and idle the engine. Check around the oilpan drain plug and filter for signs of a leak. If oil is leaking, tighten the part a bit more. If the leak continues, damage exists that should be fixed.

What do you do with old oil that's been drained? You can pour it into large plastic containers like those used for household bleach, screw on caps, clearly mark containers "Used Engine Oil," and place them out for the garbage pickup. You can also ask a local service station attendant if he would dispose of the oil. Some oil companies pick up used oil from service stations.

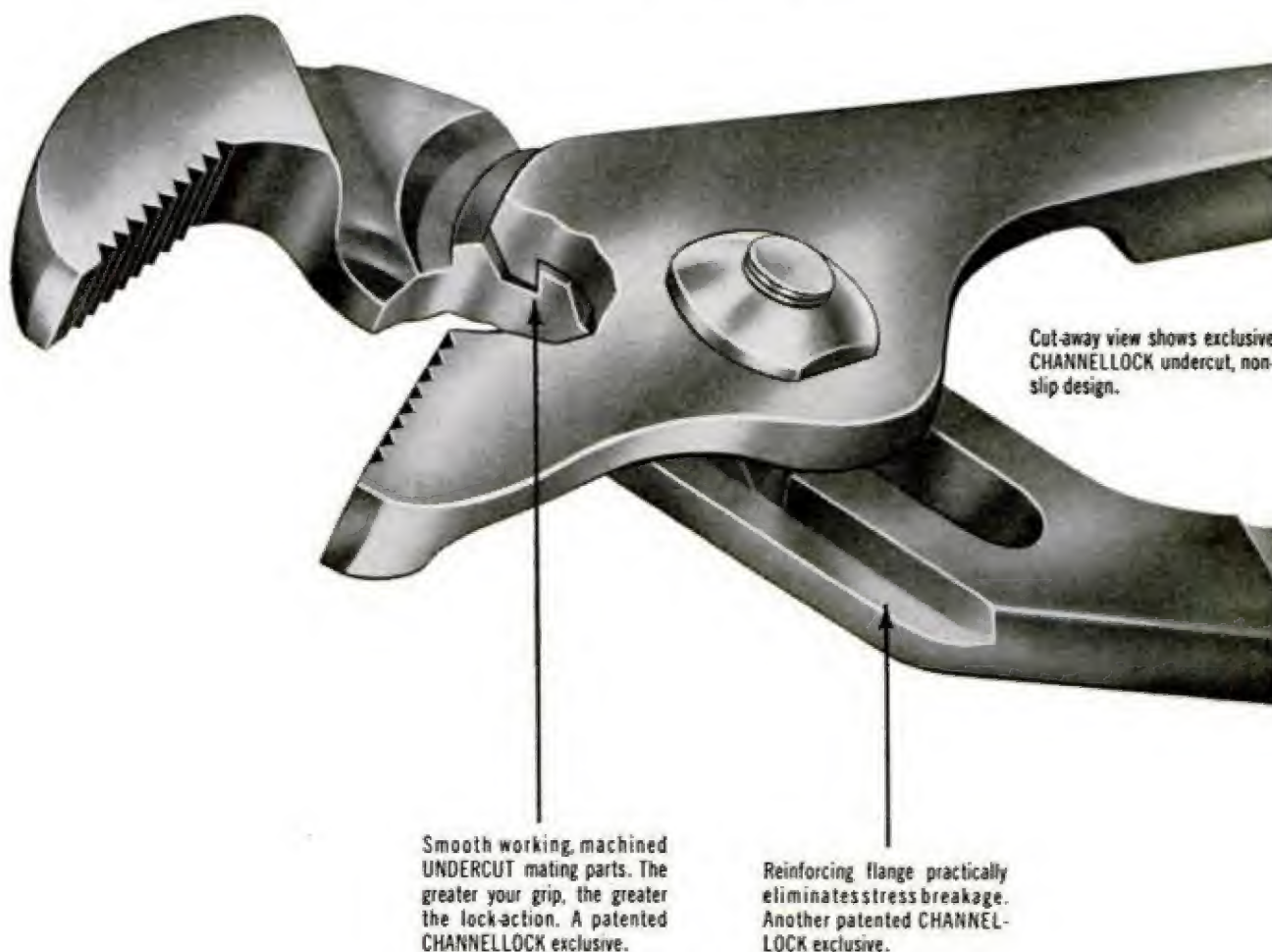
Important: When working on a car be sure a manual transmission is in gear and an automatic transmission is in Park, the parking brake is firmly applied and wheels are chocked. This is even more critical when you're working beneath the car.

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Lubricating the chassis

For vehicle safety and performance, periodically lubricate the front suspension and steering-linkage ball joints, and front-wheel bearings. Also check and replenish the fluid in the rear axle, transmission, power-steering reservoir and brake master cylinder.

Some manufacturers recommend a chassis lubrication every 6000 miles. Others suggest that it be done every 36,000 miles. Some cars are lifetime lubricated. It depends on the year, car and make, so consult service literature. However, keep in mind that lubrication done before time hurts nothing.

Equipment you'll need costs about \$20, but it's a one-shot investment. The following will give you an idea of what this equipment is, but discuss requirements for your particular car with a local automotive parts and accessories dealer:

- All-purpose grease gun rated at 10,000 lbs. The gun should be the kind that accepts cartridges of grease. It's easiest and neatest to work with. Simply slip a cartridge into the gun and go to work.
- Flexible extension adapter for the grease gun to get at hard-to-reach components, particularly the upper ball joints.
- Suction gun for adding (and draining, when necessary) rear axle and manual transmission lubricant. You can wait to buy this piece of equipment until you need it, which might not be at all if you trade cars often.
- Grease fittings. The ball

joints of most cars are sealed with plugs that are removed to permit insertion of grease fittings. Grease fittings are available in various sizes and shapes. Some are straight, some have a 45° bend and some a 90° bend. Determine which shape will allow ease of lubrication. For example, you may not be able to get a grease gun easily on a 90° fitting, but will find that a straight fitting serves your purpose.

● Lubrication chart for your car, which will tell what and when to lubricate. Write the manufacturer's technical publications department. If the chart is not available, but you have an acquaintance working in a service station, ask him. Oil companies issue lubrication charts for domestic and foreign cars. Perhaps you can borrow the one for your car for a few minutes in order to make a copy. Another source may be the dealer from whom you buy equipment.

When it comes to grease, your automotive parts and accessories dealer can help you select exactly the kind you will need. Usually, these types are necessary:

- Multipurpose chassis lubricant with a lithium base for lubricating front suspension and steering linkage ball joints, and other parts such as the clutch linkage.
- Wheel-bearing lubricant.
- Multipurpose gear lubricant for filling the manual transmission and conventionally designed rear axle.
- Automatic-transmission fluid.

- Limited-slip gear lubricant for filling limited-slip rear axles.
- Power-steering fluid.
- Heavy-duty brake fluid of the highest quality.

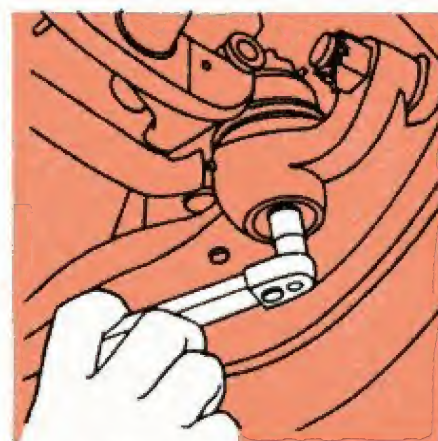
One problem you will have to face is working beneath the car. If you can borrow a gas station's or garage's lift or grease pit for a time, do so. If not, you will have to lubricate the vehicle while lying flat on your back, which is difficult, or by placing the car on heavy-duty adjustable jack stands. These will give you some room to maneuver by raising the car about two or three feet off the ground.

Make sure that jack stands are placed beneath solid points, such as the frame and rear axle.

All set? Here, then, are a number of tips that will make your lubrication task easier:

Ball joints. A chassis possesses at least four front suspension ball joints—two upper and two lower. Most models also have tie-rod end and pitman-arm ball joints.

To lubricate a ball joint, wipe the area clean. If joints are fitted with plugs, usually metal, remove them with an appropriate-sized socket wrench.



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with service when you need it. Of course, we know you'd feel even better if you needed less service in the first place. That's why we think a car that needs less service is the ultimate solution.

Here are some of our programs which are designed to make you happier with service when you need it:

1. We help women help themselves. Women on Wheels is a program designed to help give women a better understanding of their car. Offered free by many Dodge and Chrysler-Plymouth dealers, the program is teaching women how to tell when something is going wrong—and what to do about it. So far, more than 12,000 women have taken advantage of this get-to-know-your-car course.

2. We're training new mechanics. MoTech is one of the industry's newest service programs. It will train hundreds of new mechanics every year, in every phase of service. MoTech is designed to help relieve the mechanic shortage by providing a constant flow of qualified new mechanics into the work force.

3. We keep 40,000 mechanics up to date. Our Master Technicians Service Conference helps make service easier and faster for you by offering training materials to 40,000 mechanics every year. The Conference also introduces new techniques and vital information to mechanics on a monthly basis. It's the oldest continuous service program in the industry.

4. We help teach teens, too. The Plymouth Trouble Shooting Program has been helping develop student automobile mechanics for 24 years. The program encourages high school and trade school students to sharpen their skills in automotive mechanics by awarding scholarships to those who are best able to diagnose and correct mechanical trouble.

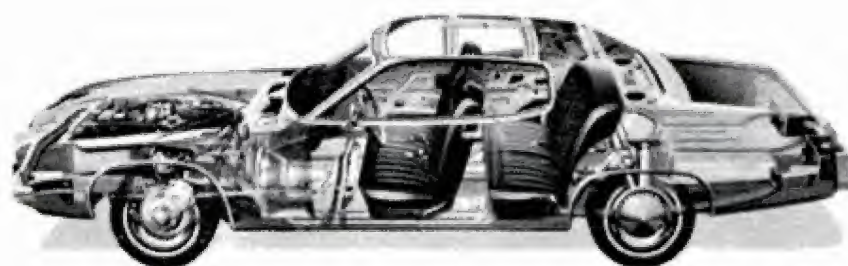
Here are some of our "extra care in engineering" features which add up to less service to help you save time and money:

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3. Fewer recommended spark plug replacements than

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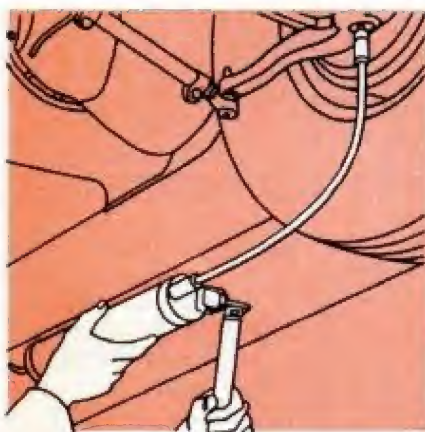
5. No recommended transmission service under normal driving conditions.



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Plugs of some older model cars are rubber. They have to be pulled out and replaced if damaged. However, you may leave grease fittings in the ball joints in place of rubber plugs.

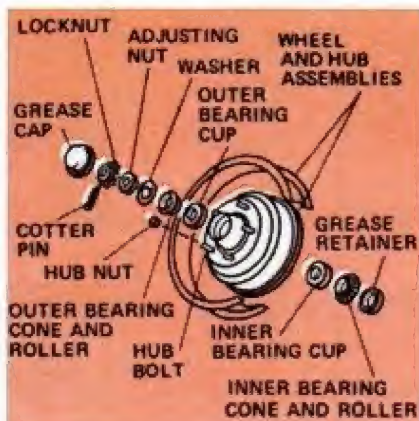
With the plug removed, insert a grease fitting and attach the grease gun. Then carefully pump in grease until the rubber boot starts swelling.



You can see or feel the boot swelling. Once the swelling has started, stop greasing. Don't force in the lubricant to the point where it will start escaping from the boot. When this point is reached, there is danger of popping the seal protecting the ball joint from water and dirt.

Remove the grease gun and grease fitting and reinsert the plug tightly, or leave the fitting in place for the next lubrication.

Front-wheel bearings. Unless you have had previous experience in servicing bearings on cars with disc brakes, you may want to leave the job to a mechanic since the brake-caliper assembly has to be removed. Instructions here concern cars that are equipped with drum brakes.



Pry off wheel cover and grease cap with screwdriver to reveal a castellated nut held by a cotter pin. Remove and discard pin, then remove the nut and adjusting nut under it. Lay all parts on a clean surface and clean your hands. Dirt is a bearing's No. 1 enemy.

Wipe all grease from the spindle with a clean lintfree cloth. Grasp wheel assembly and jerk it forward and back about an inch each way. This will leave the outer wheel bearing and thrust washer lying on the spindle. Remove them and lay them aside.

Take wheel assembly off spindle and lay it face up on clean paper or cloth. Put a brass drift on inner race of the inner wheel bearing and gently tap around bearing's circumference until the bearing and the grease retainer fall from the wheel. Discard the retainer.



Shine a light inside the hub and examine the cups for any pitting, nicks and scars. Knock a damaged cup out with a drift. You can install a new one by gently tapping it into place with the drift.

Turn your attention to bearings. If you find one that has an acrid odor or old grease that has turned black, that bearing is probably burned and should be replaced. But first wash each bearing in wheel-bearing solvent. Work the solvent between the roller needles with a clean, soft brush. Then lay the bearings on a clean cloth and allow them to dry.

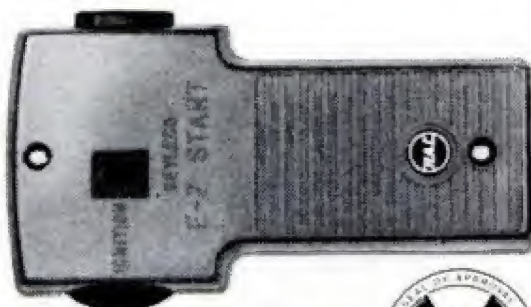
When handling bearings, don't touch the needles. Grasp bearings by the races.

When bearings are dry, dip them in clean, lightweight engine oil. Examine each closely for cracks, pitting and other damage. Make sure bearings aren't rusted or black. A slight bluish or straw cast is acceptable. Slowly spin each bearing, and feel for binding and scratchiness. Replace any damaged bearing.



Lubricate bearings, whether old or new, by placing a liberal amount of grease

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in the palm of your hand and working the bearing into it. You can also use a bearing packer that can be bought from an automotive parts and accessories dealer.

Don't skimp on grease. See to it that lubricant gets between needles. A bearing can't get too much grease.

Install the inner bearing by cleaning the inside of the wheel hub with wheel-bearing solvent or kerosene. Allow it to dry. Apply a light coating of wheel-bearing grease to the hub and place the inner bearing inside the hub with finger pressure.

Dip a new grease retainer in clean lightweight oil and lay it over the inner bearing. Place the grease-retainer seating tool over the retainer and give the tool a whack with a hammer to seat the retainer. Make sure of a tight fit by tapping the edge of the retainer with a drift.

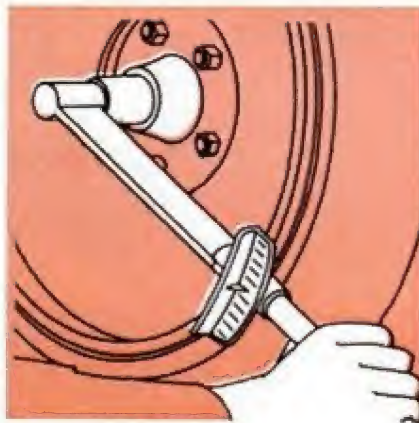


Clean the inside of the brake drum with a rag moistened in kerosene if there is grease on the drum. Place the wheel assembly carefully on the wheel spindle, slip the outer bearing into its cup in the wheel hub, install the thrust washer and run up the adjusting nut.

The bearing now has to be

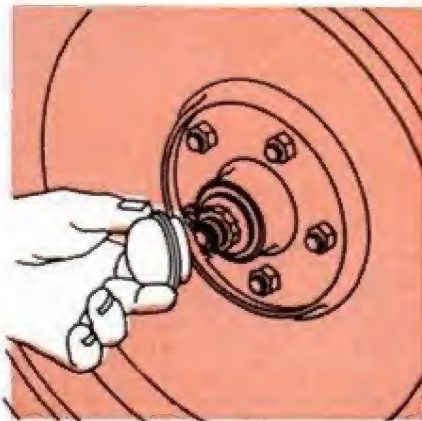
adjusted. You will need the wheel-bearing adjustment specification for your car, so consult service data. Adjustment is done pretty much the same for each car.

Spin the wheel by hand as you torque the adjusting nut to specification. This is about 20 ft.-lb., but you had better check the manual.



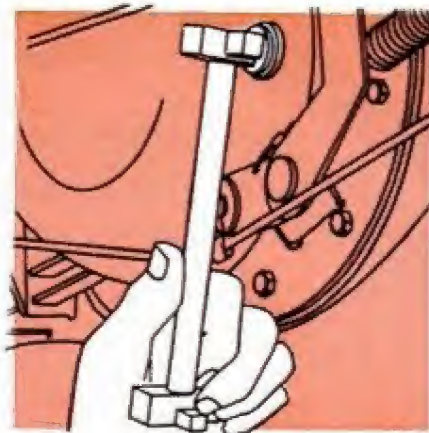
Loosen the adjusting nut one-third to one-half turn. While rotating the assembly by hand, tighten nut finger-tight to complete adjustment.

Place the castellated nut on the spindle and install a new cotter pin, making sure its legs are spread and wrapped around the nut. Clean inside of the grease cap and put it back on.

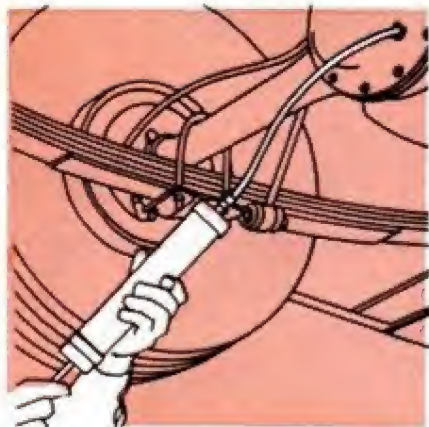


Rear axle. Remove the rear-axle oil-level plug. Some plugs are "hexed" and have to be removed with an Allen

wrench. Make a drawing of the kind of plug your car has and take it to your parts and accessories dealer, who will give you the correct wrench.



The rear-axle lubricant level should be on line with the bottom of the oil-level plug hole. Insert your little finger in the hole to check this. If you find that the lubricant isn't up to level, add the correct fluid with the suction gun.



Limited-slip rear axles require a special lubricant in order to keep friction devices from chattering as they engage. Don't use a multi-purpose gear oil in a limited-slip rear axle—it's intended only for a conventional axle.

Transmission. Remove the oil-level plug from the housing of a manual

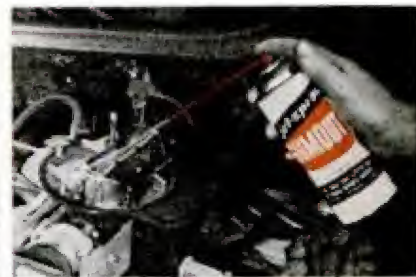
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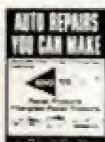
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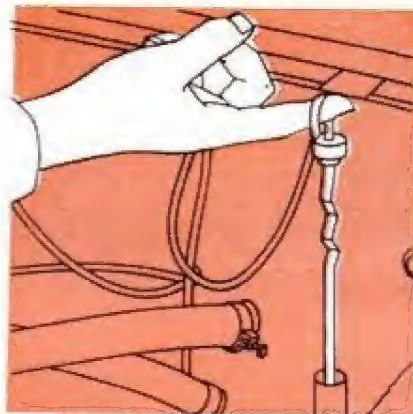
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3

transmission. This is probably located on one side or the other. The fluid level should be on line with the bottom of the plug hole. Add a multipurpose gear oil if it should be needed.

As long as you're at the transmission, place a few drops of engine oil on the pivot points of the shift arms. This will assure smooth shifting.

To check the fluid level of an automatic transmission, make sure that the car is warmed up (the transmission has to be at normal operating temperature), the car is parked on a level surface and the engine is idling. Move the shift lever through all its positions and return it to Neutral. Wipe off dirt from the transmission dipstick tube and pull out the dipstick.



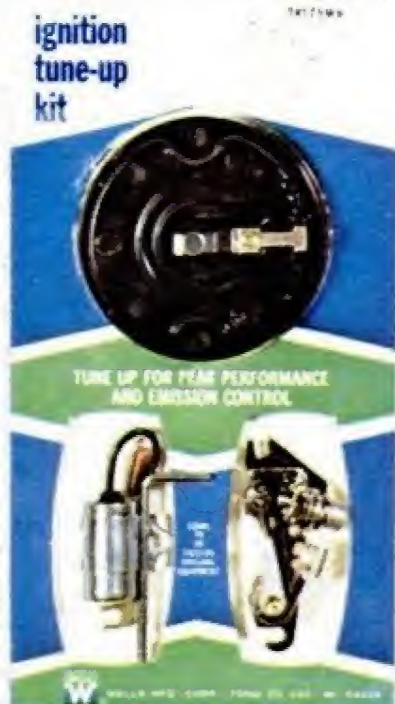
Wipe off the dipstick with a clean cloth or paper towel, and return it to the tube, making sure that it's pushed down all the way. Remove it again and read the level.

If the level is below the *Full* mark, add automatic transmission fluid through the dipstick tube. It will take about one pint of the fluid to fill the gap between the *Add*

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and *Full* marks on the dipstick.

Do not overfill the transmission, and make sure that you use only a high-quality fluid.

Power-steering reservoir. To check the fluid level of a power-steering unit, remove the dipstick from the reservoir. Add power-steering fluid to raise the level on the dipstick to *Full*.



Brake master cylinder.

If you have a see-through brake fluid reservoir, you can check level at a glance. If not, check as follows: Release hold-down fastener and lift off the cap, being careful not to damage the gasket. If you find that the level is less than $\frac{1}{4}$ inch below the top of the cylinder, add a high-quality brake fluid.

Eliminating Body Noise

Rattles caused by a loose part are easily traced by using a rubber mallet. Starting at one end of the car, gently strike the body over its entire surface with the mallet.



When you hear the rattle, check the area for nuts and bolts, and tighten them all. Overlooking nothing. Something as innocuous as a loose license plate can create an annoying racket.

If windows rattle, weatherstripping may be worn or might have come loose. Pull the weatherstripping from the channel, and clean the channel out with a rag that has been dampened in kerosene or a cleaning solvent recommended by your parts and accessories dealer. If weatherstripping looks worn, replace it.

Apply a coating of rubber cement to the window channel and to the back side of weatherstripping. Let the cement get tacky, and then press the weatherstripping firmly into the channel.

Noise created by wind is another problem that can often be overcome, but first you have to find the offending member. Frequently, wind noise is created by a

radio antenna, so push the antenna down and drive the car to see if noise has been eliminated or has lessened. If wind noise is being created by the antenna, there isn't much you can do except to drive with the antenna retracted.

Noise is also produced when wind gets beneath a door or fender molding strip. To trace the noisy molding, tape over each strip in turn with masking tape and road test the car. When the offending strip has been found, remove it from its clips, fill its back side with auto caulking compound and reattach the strip to the car.

Wind will also make noise if window or door weatherstripping isn't attached properly or is loose. To find the leaking component, tape each window and door in turn and road test the car.



When the ill-fitting weatherstripping is uncovered, pull it from the channel and reattach it properly as explained above.

Body points require periodic lubrication to keep them from squeaking. These points include seat tracks and hinges of doors, trunk, hood and tailgates of station wagons and hatch-

backs. Use an all-purpose white grease to lubricate metal body points that slide or touch other parts—for example, latches, hinges and catches.

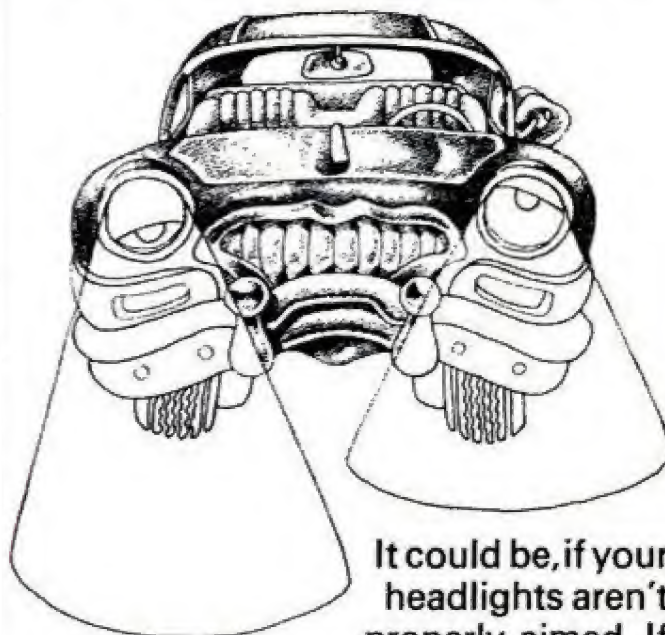


Use SAE 20 engine oil to lubricate all body points that require penetrating oil—for instance, the door hinge pins. You'll find it easiest to apply this with a long curved, needle-nose-spout oil can.



Use a silicone lubricant on all rubber weather seals to minimize deterioration and to reduce damage from scuffing.

Is your car cockeyed?

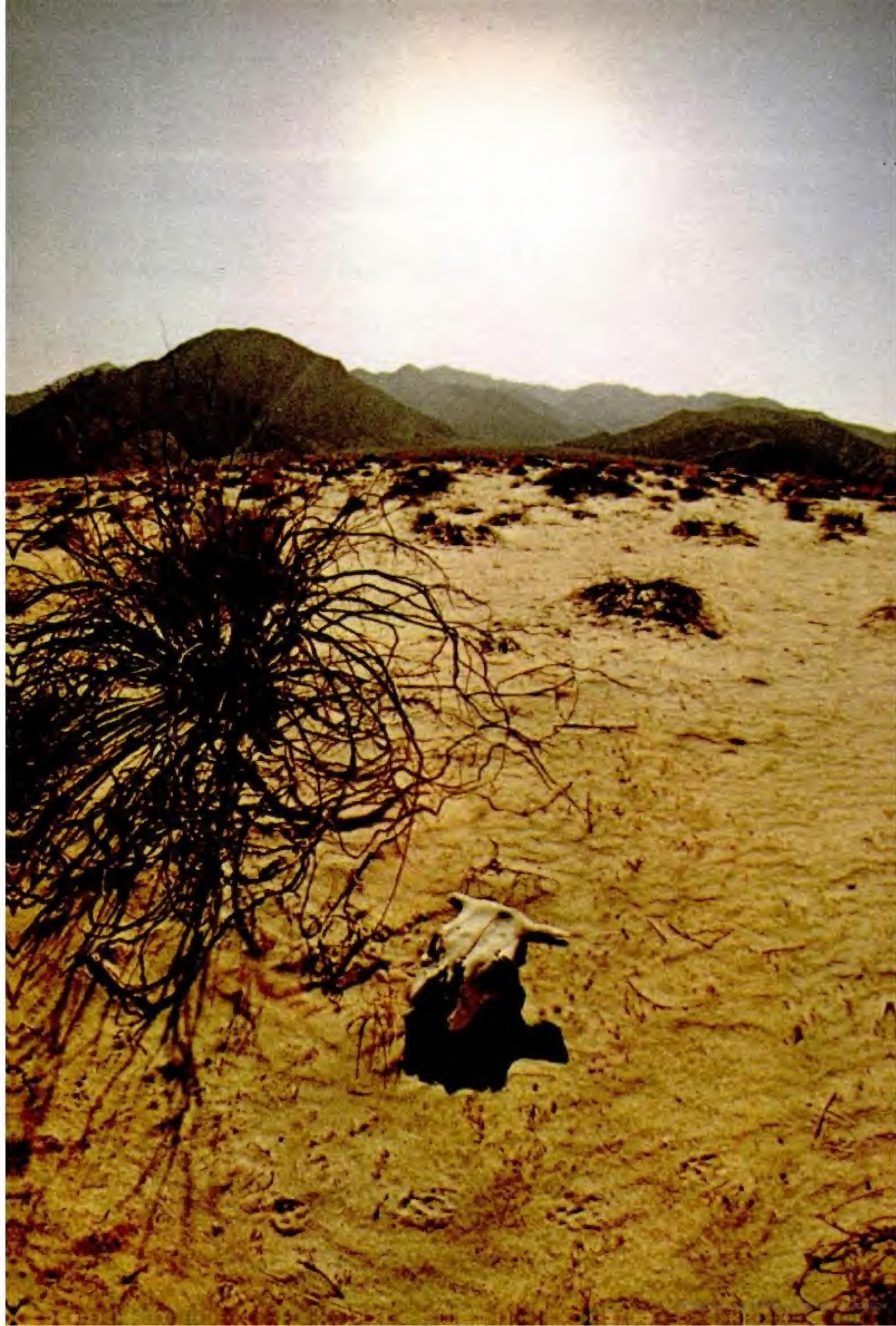


It could be, if your headlights aren't properly aimed. If they're only 1° too low, your seeing distance is cut in half because they don't deliver the light in the proper place.

So for safety's sake, check your headlights and have them aimed. Check your other lights too. Burned-out lights are not only a safety hazard; they are also the #1 cause for rejects at vehicle safety checks.

If you have burnouts, replace them with dependable GE lamps. Be sure you get Plus 25 headlamps because they deliver more light, at least 25 feet further down the road than previous standard headlamps. They're easy to install yourself. Or have your service station do it. General Electric, Nela Park, #3382, Cleveland, Ohio 44112.

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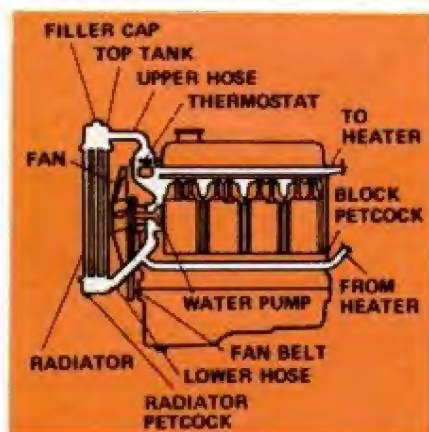
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Popular Mechanics Car Care Guide



3 COOLING SYSTEM



The modern cooling system is one of the most efficient and carefully designed engine systems. Yet overheating continues as a common on-the-road emergency. Why?

The answer may lie with car-owner misunderstanding. A cooling system requires little maintenance. However, that does not mean "no maintenance." A cooling system that gets no maintenance will sooner or later start gushing steam.

A practical cooling-system service plan has two separate parts: inspection and maintenance. Inspection should be done at least twice a year (spring and fall) to detect a potential

problem before it can strand you on the side of the road.

Maintenance should be done every 24,000 miles or two years, whichever occurs first, to give the system a complete test and cleaning.

The remainder of this section describes the semiannual inspection plan and the 24,000-mile (or two-year) maintenance plan.

Cooling system inspection

Check hoses, radiator, coolant, drive belts and water pump.

Hoses. Squeeze hoses at top and bottom of radiator firmly over their entire area. If a hose shows tiny cracks under pressure or feels spongy, replace it.

Examine the area around hose clamps for white or rust-colored stains that signify a possible leak. Tighten clamps and check again. If the problem persists, replace hose and, if necessary, the clamp.

Examine heater hoses the same way. If one fails coolant will be lost.

Some engines have a bypass hose between water pump and block. Check it for cracks and deterioration.



When replacing a hose, clean the pipe connection

with a wire brush and apply a nonhardening rubber-hose sealing compound. Position hose clamps at least $\frac{1}{8}$ inch from the ends. If you use screw-down clamps, make sure that they are securely tightened. A pressurized cooling system could blow a hose right off its connection if the hose isn't positioned properly or if the hose clamp isn't tight.

Speaking of hoses, here is a tip that may save you time and aggravation some day. Lower radiator hoses contain coil springs that keep them from collapsing under pressure during high-speed driving. If your car suddenly begins overheating at fast speeds for no apparent reason, replace the lower hose. Its spring may have lost tension.



Radiator. Examine the radiator surface for whitish deposits that indicate a leak. You can try patching a leak by draining antifreeze and putting in antileak ethylene glycol, which contains polymer particles that fill and seal small leaks. You could also add a can of a leak-stopping compound to the present coolant. These compounds have an oil-soluble base that

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gives antifreeze an oily appearance. It's nothing to worry about. Of course, both of these are quick fixes for small leaks.

Periodically, clean out dead bugs and other debris that may be cutting down on cooling. If you have access to compressed air, direct the airstream from the inside out.

Check to see that the radiator pressure cap locks itself firmly to the radiator filler neck. If not, the cap or neck is damaged. Replace a damaged cap. If the filler neck is damaged, have a radiator specialist cut off the old neck and install a new one. The radiator does not usually need replacing.

Coolant. Good-quality ethylene glycol antifreeze—the only coolant you should put into your car's cooling system—will normally protect your engine for two years. However, check the condition of coolant twice a year to determine if more frequent service is needed.

If coolant looks rusty, you shouldn't wait to clean out the system. Do it immediately.

Run your finger around the filler neck. If it becomes coated with brown sludge, an even more thorough cleaning is necessary; reverse flush the system. Directions are supplied with the necessary T-connectors available at parts stores.

Drive belts and water pump. Check the drive belt as explained in the Engine Tune-Up Section. A belt that is glazed or not adjusted to specification can affect cooling. A damaged belt can

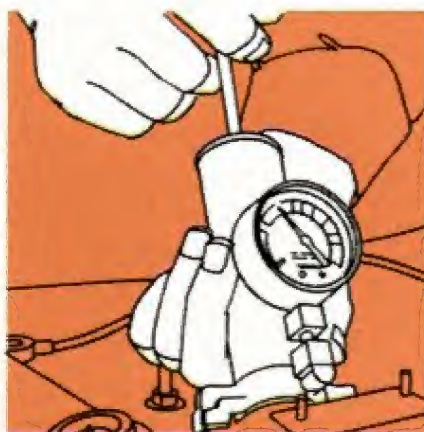
break and cause overheating.

Check the water pump by letting the engine idle for a minute or two. Shut it off and sweep your hand around the pump. If it comes away wet, the pump is failing. Repair or replace it before it fails completely.

Cooling system maintenance

At least every 24,000 miles or two years perform a complete cooling-system maintenance service: (1) test the radiator pressure cap; (2) pressure-test the system for leaks; (3) test the thermostat; (4) test the fan clutch if the engine is so equipped; (5) drain and flush the system and install fresh antifreeze.

An important tool you may want to purchase as an investment is a cooling-system pressure tester. There are two types:



The most common, pictured here, requires that you make two separate tests—one of the radiator cap and one for system leaks.

The second type allows these tests to be made at the same time. This one-step tester connects to a threaded adapter which is inserted into the engine in place of the temperature-sending

unit. With the tester hooked up, the overflow tube is disconnected from the side of the radiator so its lower end can be inserted in a container of water. The unit's dial is read after the tester is pumped up to determine if the cap is faulty or if a leak exists.

The instructions that follow detail how to use the more common first type of tester.

Testing the radiator cap. Pressurizing the cooling system effectively raises the temperature at which the coolant will boil. The radiator cap is the most important part contributing to pressurization.

The boiling point of a mixture of ethylene glycol to protect an engine against freezing to minus 20° F. is 224° F. However, when this solution is put under the pressure of a 15-pound cap, its boiling point is increased to approximately 260° F. (at sea level).

When a radiator cap loses its ability to hold pressure, overheating occurs. Hold the cap upside down in your hand and look "through" it. If light is seen between the vent valve and rubber gasket, or if the gasket is damaged, replace the cap.

Wash the cap and attach it to the tester. Pump the tester until the dial needle shows the cap's capacity, which is marked on the cap. If the needle drops more than two pounds from the rating, replace the cap.

Pressure-testing for leaks. Coolant leaks occur most often at hose connections, the thermostat housing and

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radiator tank-core seams. Testing should be done with the engine both cold and at operating temperature since leaks may occur under one condition, but not the other.

With engine off, remove the radiator cap (slowly if engine is warm), connect the tester to the radiator and pump it until the dial reads the capacity marked on the cap. Wait 10 minutes; if the reading falls, there's a leak.

Leaks are often stopped by replacing a hose and clamp, using an antileak ethylene glycol antifreeze or leak-stopping additive, or replacing a thermostat gasket.

Testing the thermostat. Obtain the type of cooling-system thermometer shown below (calibrated to at least 212° F.) from your auto parts and accessories dealer.



Check service data to determine the rating of your thermostat. It's probably in the 185°-210° F. range.

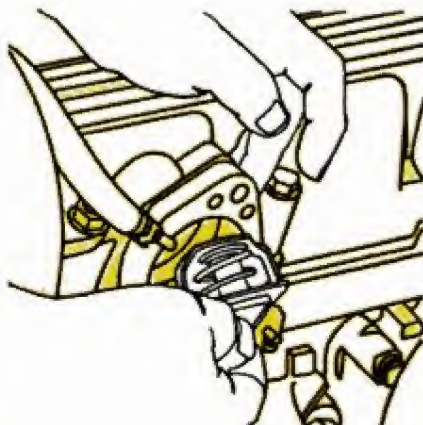
Make sure coolant is at the **Full** mark. Drive car about 10 minutes or let engine idle about 20 minutes. Carefully remove the radiator cap by covering it with a rag and turning it counterclockwise to the first stop. Don't put downward force on the cap.

Now wait. Let pressure

escape (it will hiss). When it has relieved itself (hissing will stop), push the cap down and remove it.

Place the thermometer in the filler neck, making sure the bulb is submerged in coolant. The thermometer should immediately register at least 212° F. Start the engine and let it idle. If coolant temperature stabilizes at 8° to 10° below its rating, the thermostat can be kept in service.

If the thermometer shows higher or lower readings, replace the thermostat. Drain coolant down below level of the thermostat housing, remove the hose, unbolt the thermostat housing and take the thermostat from its seat.



Make sure the new thermostat has the rating of the old one. Use a new thermostat housing gasket.

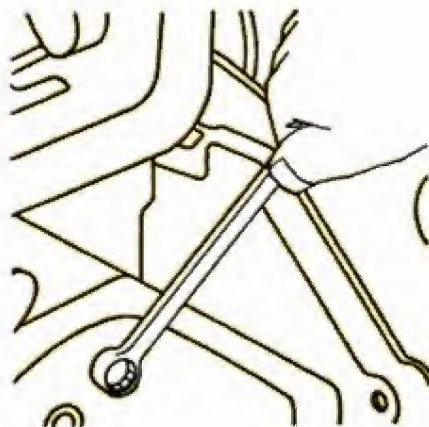
Testing the fan clutch. Most engines equipped for airconditioning and heavy-duty cooling have a fan drive that is thermostatically controlled. When maximum cooling is not required—for example, when the air-conditioner is off, the clutch controlling the fan is disengaged to limit fan speed to about 1200 rpm.

When temperature rises, as it would with the conditioner on, a thermostat causes the clutch to engage, which allows the fan to rotate at about 2400 rpm.

To see if the fan assembly is operating properly, spin it by hand with the engine cold. It should turn freely. Look for a fluid (silicone) leak; this means the clutch bearing is probably faulty.

Be aware of any excessive noise (especially a roar) coming from the fan with the engine running. It could mean a "frozen" clutch. Check assembly for free movement by hand (engine cold and off). If clutch has locked, you won't be able to rotate the assembly easily.

Draining and cleaning. Warm up the engine, shut it off, open the drain cock at the bottom of the radiator and remove the threaded drain plug(s) from the block. Six-cylinder engines usually have one drain plug; V8s normally have two. Make sure that the heater is on while the cooling system is draining so coolant will drain from that unit.



When coolant has drained, close the radiator drain cock and reinsert drain plugs securely. Fill the system

with water and a commercial fast-flush preparation that you can buy from a parts and accessories dealer.



Run the engine for the time recommended on the fast-flush container. Follow all directions. Leave heater on so it can get the benefit of the cleaning agent. At times, increase engine speed gradually to let the cleaning agent flow more forcefully through the system and dislodge stubborn scale.

At the end of the cleaning period, drain the system and flush with clear water, if the maker of the cleaning agent so recommends. Usually, a cooling system is clean when water draining from the radiator looks clean.

With the system clean and all drain points closed, fill the radiator with a mixture of high quality ethylene glycol antifreeze to meet the lowest anticipated temperature in your area. Check directions on the antifreeze container or consult with your auto parts dealer for the proper mix.

Don't use water as a coolant. Modern cooling systems require protection afforded by ethylene glycol as a year-round coolant. It contains rust inhibitors and

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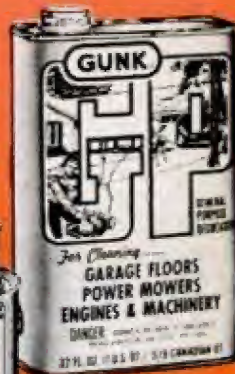
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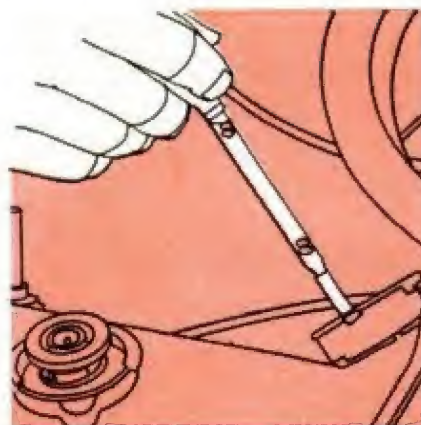
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City

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water-pump lubricant, and provides greater protection against overheating.

The ability of ethylene glycol to protect an engine against cold weather should be tested at the start of each winter. You can buy an inexpensive hydrometer of the type seen here from a parts and accessories dealer. Coolant potency is revealed by the number of balls floating in the solution drawn into the tube

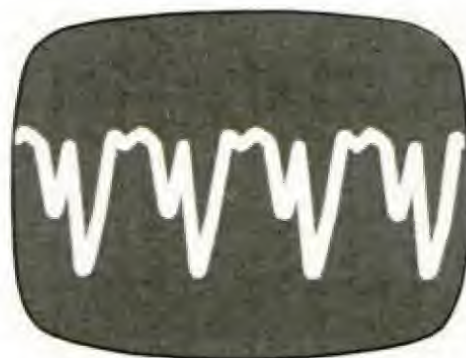


Keep your eye on the temperature indicator light. If it doesn't work properly, it can't warn you of an overheating condition.

Check this warning light by turning on the ignition key. The light should glow. Crank the engine. The light should glow, but should go out when the engine starts. If the light doesn't light under these conditions, the bulb has burned out, the fuse has blown or there is an open circuit.

One more thing about this temperature warning light—if it glows when the engine is not overheating, this means that the temperature sending unit is defective. After locating it on the engine, it's easy to remove and replace with a new one.

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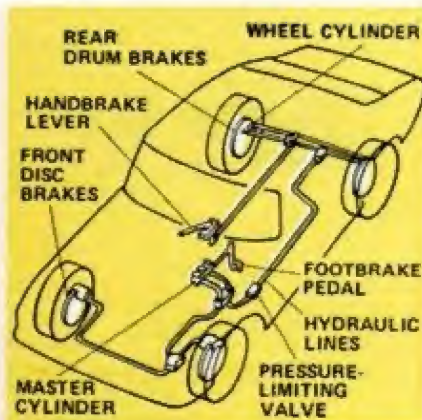
AUTOMOTIVE PRODUCTS



Popular Mechanics Car Care Guide



4 BRAKES

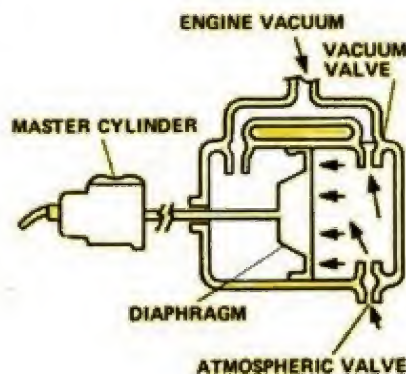


Your car may have conventional (drum) brakes on all four wheels, disc brakes in front and drum brakes in the rear, or disc brakes on all four wheels. Whatever arrangement your car has is actuated by a hydraulic system. Major parts of the system are:

- Master cylinder. This is a reservoir for brake fluid. Many cars are equipped with a power-assist unit (so-called power brake) to ease driver-braking effort by introducing vacuum to help apply pressure to the hydraulic system.

In cars equipped with an assist unit for the brakes, the unit is attached to the firewall and the master

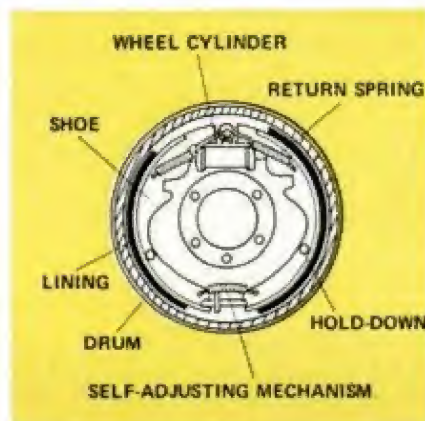
cylinder is attached to the assist unit.



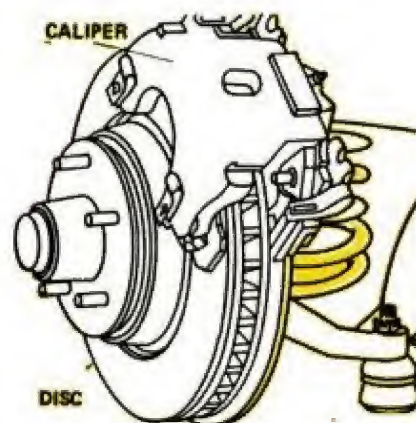
- Brake lines. These are metal tubes and rubber hoses that carry brake fluid from the master cylinder to the brake at each wheel. In a drum-brake system, there is, in addition to the master cylinder, a wheel cylinder at each wheel. It applies hydraulic pressure to force the brake linings against the revolving brake drum to stop wheel rotation.

Brake linings are heat-resistant, frictional materials attached to metal backings that are called brake shoes.

Brake hardware of drum brakes includes a self-adjusting mechanism, hold-down parts and return springs. The parts activate and control brake shoes. The diagram below shows a typical drum brake.



Major parts of disc brakes are the disc and caliper assembly. A caliper assembly contains a piston to exert pressure against pads (linings) when the piston is activated by hydraulic pressure. Pads press against the revolving disc to stop wheel rotation. A typical disc brake is shown below.

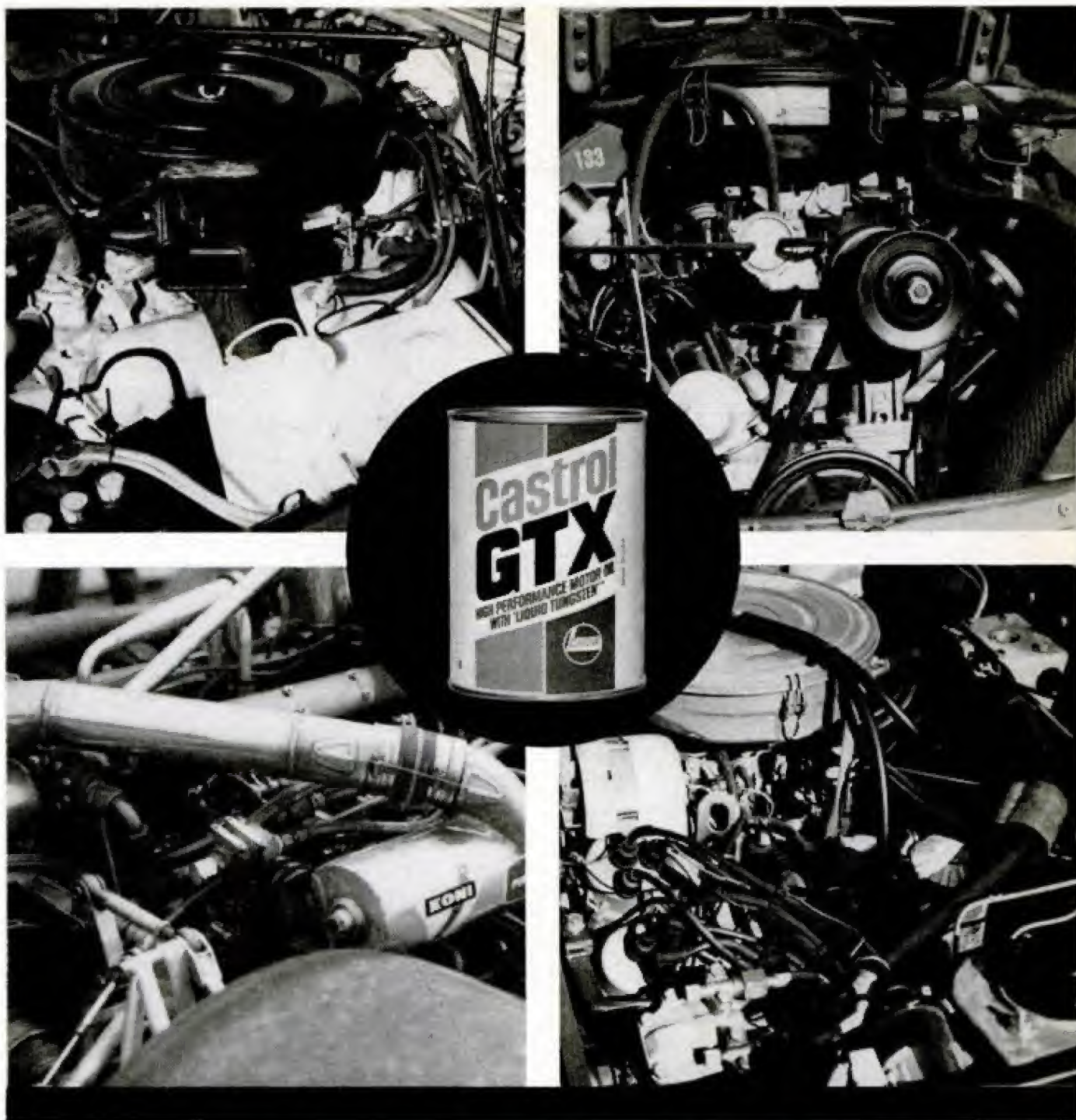


Most car owners will leave overhaul of a faulty braking system to a competent professional mechanic. But you can inspect the system yourself to uncover a developing problem, thus averting a major safety hazard and more expensive repair. And you can do many repairs, too.

Brakes should be inspected every 10,000 miles. Be on guard, however, for variations in the braking pattern and try to find out what's wrong if there's a change. The best judge of brake performance is you—as you apply the pedal.

Brake-system inspection

To check for brake-fluid leaks hold your foot lightly on the brake pedal about 15 seconds. The pedal should not move. Repeat, this time with firm pressure; the pedal



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*March, 1973 Issue



still should not move. Conduct this test with engine idling if the car has a power-assist unit.

If a leak is indicated, start tracing it at the master cylinder. Clean the master-cylinder cover and remove it. Some covers are held by a clip—others by a bolt. Be careful not to damage the gasket. You have to reuse it.



If master-cylinder fluid level is low, a leak in the hydraulic system is probable. However, a qualification should be made for systems that are equipped with front disc brakes.

The front reservoir of the master cylinder provides fluid for the front disc brakes; the rear reservoir provides it for the rear drum brakes. If fluid in the front reservoir is below level, a leak may not exist. This could indicate worn disc-brake pads.

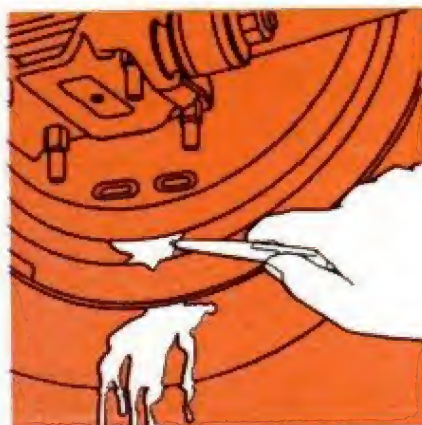
A brake system can leak fluid from a line, wheel cylinder (drum brake), master cylinder or a loose or distorted connection. Inspect carefully from the master cylinder to each wheel as someone slowly pumps the pedal to put the system under pressure.

If brake fluid is leaking from a connection, tightening that connection may stop the leak. Use a flare-nut wrench that fits snugly; it won't damage connections.



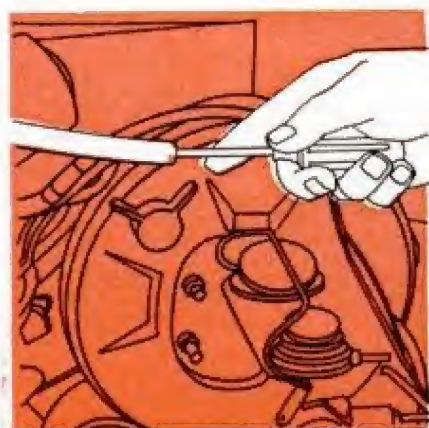
Examine all hoses and lines for cracks, dents and cuts. With the system under pressure, feel to see if any brake hose expands. Hoses should be firm. If not, they should be replaced.

Wheel cylinders of drum brakes may be leaking. An indication of this would be wet or oily-looking stains on the inside of a wheel and tire. The wheel should be removed and the faulty part repaired immediately. Inspect brake linings for saturation by the fluid which has leaked from the cylinder. If fluid has run onto linings, linings should be replaced to eliminate a grabbing brake.



Brake fluid may also be leaking from the master cylinder, so check here for wet or oily-looking signs. If your car is equipped with a power-assist unit, vacuum may be pulling fluid past faulty seals in the master cylinder, into the assist unit and from there into the vacuum hose to the engine.

To check this, remove the vacuum hose from the assist unit and twirl a screwdriver around inside the hose. If the screwdriver shank becomes coated with fluid, the master cylinder should be rebuilt or replaced.



Continue brake inspection with a road test. Perform it on a dry, reasonably smooth and level pavement.

Drive the car at 10-15 mph. Make several stops by applying light pressure to the pedal; make several more by applying medium pressure. Speed up to 60 mph and make several stops using light pressure on the pedal. Again from 60 mph, make one or two stops using hard pressure but not hard enough to lock up the wheels.

Open the window and listen for noise as you drive along and apply the brake. Malfunctioning brakes can produce a click, scrape or

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squeal. Driving alongside a concrete road divider will amplify the noise.

Don't mistake other clicking noises for a brake or wheel-bearing problem. Sometimes a wheel cover moves on the wheel as the wheel rotates, creating a click that's particularly audible as you drive along a barrier. For this reason, you might remove all wheel covers before testing.

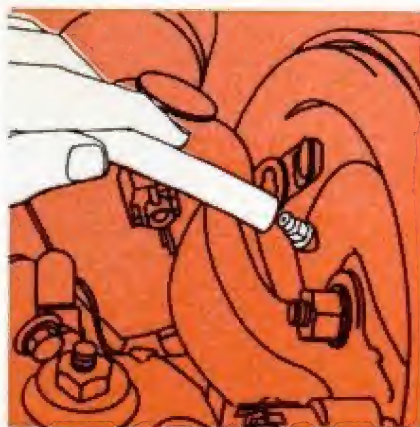
Look for these other conditions during road tests:

- Low pedal: Excessive pedal travel is needed to apply the brakes.
- Spongy pedal: A pulsating, springy sensation is felt as pedal is applied.
- Hard pedal: Excessive pressure is needed to stop the car.
- Fading pedal: Pedal falls away under pressure.
- Grabbing or pulling: The car swerves to one side as the pedal is applied.
- Chatter or shudder.
- Dragging brakes: A wheel or wheels lock.

A low brake pedal can often be brought back up by driving car back and forth several times, applying the brake pedal to bring it to a full stop each time. This activates the self-adjusting mechanism. Do this periodically to keep mechanism in operating order.

Suspect that air is trapped in the brake system if the pedal is spongy or fades under pressure, and you've recently had brake fluid added or brake work done. Bleeding will eliminate trapped air.

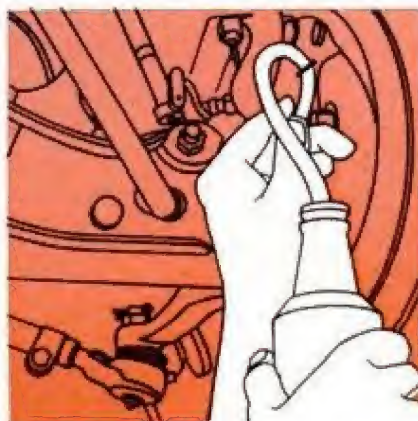
A bleed screw is provided at each wheel.



Before bleeding a power assist system, eliminate vacuum by depressing and releasing brake pedal five or six times with engine off.

To bleed brakes, be sure master-cylinder fluid is up to level and attach a bleed hose to the bleed screw. You can use a piece of vacuum hose about 18 inches long for the bleed hose.

Submerge the other end of hose in a glass or clear plastic container partially filled with clean hydraulic brake fluid. Have steady pressure applied to brake pedal and open bleed screw about $\frac{3}{4}$ turn. Be sure to maintain pedal pressure on the brake system until the bleed screw has been closed.



When brake fluid in the container stops bubbling (bubbles denote air), close the bleed screw. Be sure to repeat bleeding procedure at

all other wheels. Discard brake fluid from container when bleeding is done. Recheck master-cylinder fluid level. Add fresh fluid if needed.

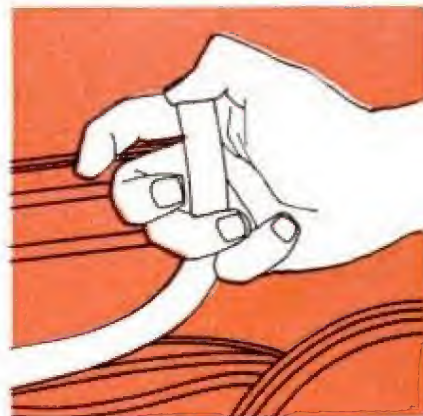
If the car pulls during the road test, you may have tires underinflated or with irregularly worn tread, a loose or worn wheel bearing, misadjusted steering or a front end out of alignment.

Troubleshooting the assist

If you have to strain to stop a car equipped with a power-assist unit, there's a malfunction. Other problems a faulty assist unit can cause are grabbing brakes, a slow-to-release brake pedal, fading brake pedal or noise.

To determine whether the trouble is caused by the power-assist unit or another part of the braking system, idle the engine several seconds to build up vacuum; then shut it off. Pump the brake pedal slowly a few times, feeling for increase in effort. The increase should be noticeable. If not, you have a problem with the power-assist.

Disconnect the intake manifold-to-power-assist unit vacuum hose at assist unit. Start engine and place your thumb tightly over the hose.



You should feel strong suction. If you don't, check the hose for kinks, cuts and cracks. Replace a damaged hose. If the hose is in good condition, then lack of vacuum points to an engine malfunction.

One part of the otherwise reliable power-assist unit which goes bad most often is the check valve. It is positioned in most cases in the assist unit at the end of the vacuum hose.

Manifold vacuum pulls air from inside the assist unit through the check valve, which sees to it that no air gets back into the unit. The valve, therefore, works in one direction only.

To test the valve, take it from its seat and blow into the end to which the vacuum hose attaches. No air should pass through. Now, draw in on the valve. You should meet no resistance. Replace a faulty valve.

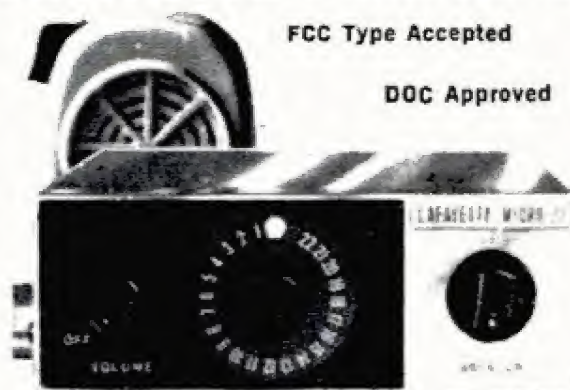


If these tests don't show why a power-assist unit has failed, the trouble probably is inside the unit—likely a damaged diaphragm.

Rebuild kits at automotive parts and accessories dealers let you make repairs at a \$20 to \$40 saving. If

(Please turn to page S48)

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American Motors Introduces The Extended Buyer Protection Plan.

**You still get 1 year or 12,000 miles of
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But now you can buy additional coverage so that
except for the replacement of tires, gas and oil,
your new 1973 AMC car
won't cost you a thing to maintain
for 2 years or 24,000 miles, whichever comes first.**

**You get double
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Plus:

1. A simple, strong guarantee.

When you buy a new 1973 car from an American Motors dealer, American Motors Corporation guarantees to you that, except for tires, it will pay for the repair or replacement of any part it supplies that is defective in material or workmanship. This guarantee is good for 12 months from the date the car is first used or 12,000 miles, whichever comes first. All we require is that the car be properly maintained and cared for under normal use and service in the fifty United States or Canada, and that guaranteed repairs or replacement be made by an American Motors dealer.

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every 5 months
or 5,000 miles.**



**And after the first
5,000 miles
we do all this.**

1. Inspect/Correct Fluid Levels (including Battery).
2. Inspect and Lubricate Heat Valve (Exhaust Manifold).
3. Inspect Drive Belts (Condition and Tension).
Correct if required.

**Then at 10,000 miles
this is what you get.**

1. Inspect/Correct Fluid Levels (including Battery).
2. Inspect and Lubricate Heat Valve (Exhaust Manifold).
3. Inspect Drive Belts (Condition and Tension).
Correct if required.
4. Inspect and Clean Exhaust Gas Recirculation Valve.
5. Inspect Exhaust Gas Recirculation Discharge Port
(6 Cyl.). Clean if required.

**At 15,000 miles
you get the works!
A front end alignment plus
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parts and labor included.**



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we do all this.**

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2. Inspect and Lubricate Heat Valve (Exhaust Manifold).
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Correct if required.
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(6 Cyl.). Clean if required.

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But now you have the option of buying American Motors new Extended Buyer Protection Plan.

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Today's automobile is a workhorse, not a Sunday touring car. Extra loads, extra equipment create more heat at low speeds, demand less fan drag for greater efficiency on the open road. Today's rigid steel fans require costly fan clutch mechanisms to provide this efficiency. However, the weight of this assembly exacts a heavy toll in water pump and fan belt wear, as well as horsepower loss.

Flex-a-lite has used the principle of aerodynamics and materials of modern technology to develop a line of deep-throated, flexible-blade fans that scoop huge quantities of air when pulling and idling. At cruising speeds the lightweight blades actually flatten out for less drag. A gas and repair bill saver for any car, a must for vehicles carrying extra equipment. Available for cars, pickups and recreational vehicles at better automotive supply houses.



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*The modern
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Flex-a-lite Corporation
Tacoma, Wn. 98499

you wish to try rebuilding a unit—replacing one part for another—you'll have to buy a tool, usually a strap wrench, to open up the unit.

Service tips

Here are several points to keep in mind that will let brakes give you many miles of safe, reliable service:

- Never use reclaimed or inferior brake fluid; always use the highest quality. Consult your car's owner's manual or ask an auto parts dealer for a recommendation.
- When brake linings have to be replaced, use linings specified by the maker of your car or consult your parts and accessories dealer. Cheap linings waste money and don't match the safety of high quality linings.
- Never let brake-fluid level get more than $\frac{1}{4}$ to $\frac{1}{2}$ inch below the top of the master cylinder.
- After new brake linings are installed, break them in properly. Don't make any unnecessarily hard, sudden stops. Use light to moderate pedal pressure for the first few hundred miles. Severe application will damage new linings and can cause erratic braking action.
- When linings of one brake need replacing, also replace those of the other brake on the same end of the car, unless fairly new. This will equalize braking action.
- Replace cracked brake drums. Never weld them and never turn drums (remove metal) more than dimension marked on the drum.
- Don't rest your foot on the pedal. You'll rub miles of service off linings.

We taught Leonard Starr how to make money doing what he used to do for fun.

Leonard Starr's father wanted him to go to college and settle down in a "nice clean job in a brokerage office." But Lennie had ideas of his own.

"I really knew what turned me on. And it wasn't the brokerage business. I like action — hot cars, motorcycles, working with tools."

"So I asked myself — 'Why not do that for a living?'"

Well, why not? Lennie Starr got in touch with ICS — the school that trains people for careers they'll enjoy. So they can get more out of the one life they've got to live.

Now, Lennie Starr is a Master Automotive Technician at the best dealership in town. He's pulling down a bigger dollar than any of his desk-bound friends — and he's having fun.

Leonard Starr is a hypothetical person — a composite of the many thousands who are using today's ICS to change the course of their lives. But how about you?

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Is electronics your bag? TV servicing? Air Conditioning? Want to earn \$7-8 an hour or more as a skilled electrician? How about a first-class FCC license? Or are you shooting for a big professional career as a full-fledged civil, mechanical or electrical engineer? You name it — and today's ICS will teach it to you.

Today's ICS is for people who like to learn by doing. ICS technical career programs include valuable professional tools and equipment that you learn to use in practical projects — then keep for your new career...

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a Philco/Ford room air conditioner with the ICS Air Conditioning and Refrigeration program...

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Training for a career with ICS is like nothing you've ever done. It's almost like taking up a fascinating new hobby — yet you wind up with a solid career skill.

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More than eight and a half million others have enrolled in ICS before you.

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- ☐ Auto Body Rebuilding
- ☐ Communications/Broadcasting Technician
- ☐ Computer Servicing
- ☐ CATV Technician

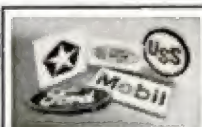
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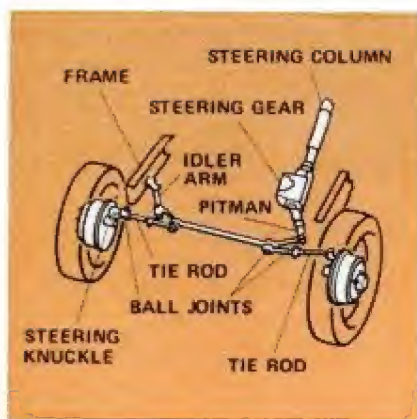


2,000 U.S. firms and government agencies — including Chrysler, Ford, U.S. Steel, Mobil, Motorola, Pan Am and DuPont — are using ICS training programs to upgrade their own employees.

Popular Mechanics Car Care Guide



5 SUSPENSION, TIRES AND STEERING



Tires, suspension and steering are independent systems, but interrelated in that they all determine how your car handles.

Tire service

There are several services you can do to extend tire life and to assure safe performances from steering and suspension. Others are beyond your scope due to lack of equipment: such as dynamic balancing of wheel-and-tire assemblies.

Although wheel balancing is no home mechanic's job, knowing when you need it and doing it only when you

need it can save you money.

An unbalanced condition exists if there is vibration (shimmy) in the steering wheel that is especially pronounced at speeds above 50 mph. Not only is it annoying, but it hastens tire and front-end wear.

Dynamic balancing (done with wheels spinning) is best, especially if you do a lot of high-speed driving. Static balancing (done on a balance tester) is not as accurate, but is often adequate.

Some car owners never get more than 20,000 miles from a set of tires. Others get 40,000. Proper care of tires is the best way to get the higher mileage.

Tire care consists of maintaining specified air pressure, periodic rotation, and inspections to find and correct damage and/or uneven wear.

One of the best investments that you can make is buying a tire air-pressure gauge. And one of the wisest services you can perform is the use of this gauge often to check tire pressure. The maintaining of correct inflation is the single most important way of getting all the mileage that a set of tires has to offer.



The reason we suggest that you buy a tire air-pressure gauge instead of using those at service stations is that the latter aren't often accurate. According to the National Bureau of Standards, one of every three air gauges tested at service stations was found to be inaccurate by four or more pounds. Three of five were found inaccurate by two or more pounds.

Check air pressure when the tires are cold. As tires run on the road and get hot, air pressure increases. This increase of pressure protects the tires against heat. Never reduce air pressure when the tires are hot.

Follow the tire inflation specifications recommended by the manufacturer of your car, even when you buy new tires. These specifications are provided in the owner's manual and also given on a decal that is normally affixed to the inside of the glove compartment door.

Every tire has an inflation pressure printed on its sidewall, but you should remember that this represents the *maximum* inflation pressure.

Remember to adjust pressure according to car load and the speed you're going to drive. When you are going long distances at turnpike speeds, give tires extra protection against heat from flexing: boost pressure as recommended by the manufacturer of your car. This figure will still be below the maximum pressure specification printed on the sidewalls of tires. There are

Only one car wax shines as you wipe it on.



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This one.

J/Wax Sprint. The only car wax out there that shines as you're putting it on! You don't wait for it to dry. You don't wait for it to haze. And you don't buff it. It's a unique emulsion formula that dries and shines as you apply it. You just wipe it on and it shines like crazy.

And that's a tough, hard-wax shine that's going to last through rain after rain. But then, that's what you'd expect from Johnson's wax.

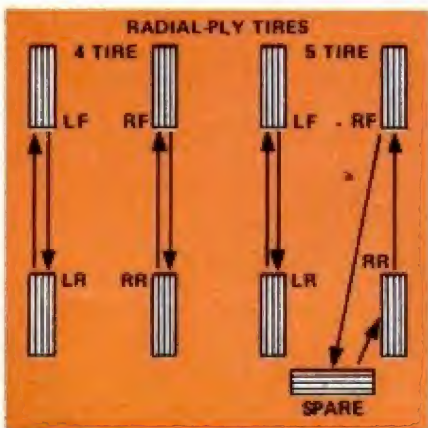
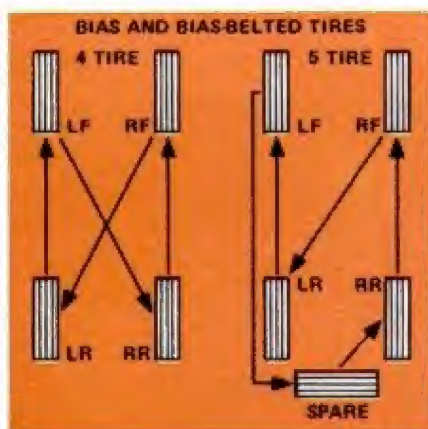
J/WAX SPRINT.
THE WIPE N' SHINE CAR WAX.
ONE OF A KIND.

differences of opinion as to whether tires should be rotated, but Firestone's reasoning is most convincing in favor of rotation:

"The front tires steer the car and absorb the brunt of the cornering forces while the rear tires deliver the drive forces. This causes front tires to wear more rapidly on the outer edges of the tread and rear tires to wear faster in the center of the tread. By rotating tires, you distribute this wear equally among all tires."

Firestone claims that a schedule of rotation every 6000-8000 miles will give up to 20 percent more miles from a set of tires.

The way in which tires are rotated depends on the type of tires you have on the car (bias and bias-belted, or radial) and on whether the spare tire is included in the rotation.



A sensible plan for tire maintenance should include a periodic examination for cuts and bulges. Carefully probe cuts. If a cut extends into the cord body or if a tire has developed a bulge, the tire is not safe and should be replaced. While inspecting tires, pry out stones and other objects that have become embedded in the tread.

Tire valves should be fitted with caps to keep dirt and moisture from getting inside of your tires when you add air.

Tires now have tread-wear indicators, which are solid rubber strips set deep in the tread that will be revealed when the tread is worn down. Still, a tread-depth gauge is a good tool to have.

Most states have laws that make it illegal to drive on tires having less than 1/16 inch of tread depth. The tread-depth gauge reveals when this point has been reached, but more important, it reveals the presence of a malfunction that is causing tread to wear irregularly from one rib to another. Waiting for this wear to become visible is an unnecessary waste of good rubber.



Test tread depth with the gauge when servicing tires. As seen in the drawing (below, center), more unnecessary tire damage is caused by incorrect inflation than any other factor. A depth gauge revealing excessive wear on outside edges, means the tire has been run while underinflated.



Excessive wear in the center tread of a tire indicates that the tire has been operated in an overinflated condition.



Irregular tread wear other than that caused by improper inflation is usually caused by incorrect front-end alignment, or a loose or worn part in the suspension or steering system.

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Get the flavor you want in
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Kings: 20 mg. "tar," 1.3 mg. nicotine
100's: 25 mg. "tar," 1.6 mg. nicotine
av. per cigarette, FTC Report Aug. '72

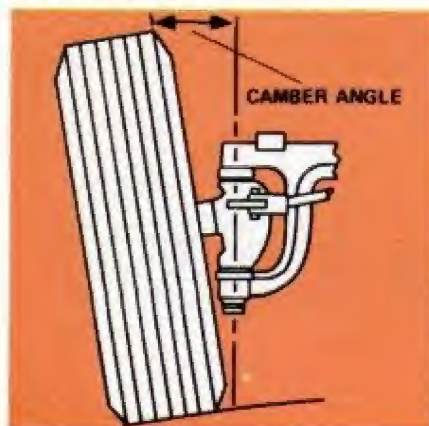
Front-end alignment

Symptoms of faulty front-end alignment in addition to that of irregular tire wear include pulling of the vehicle to one side on level roads when you take your hands off the steering wheel; wander and weaving that require constant steering to correct; hard steering, and vibration (shimmy) at low speeds.

Although it's generally recommended that front-end alignment be checked every 12,000 miles or so, this isn't necessary if none of these symptoms are apparent. Any of these problems, of course, can be caused by other malfunctions, among which are weak shock absorbers, loose or damaged wheel bearings, and even improper tire inflation.

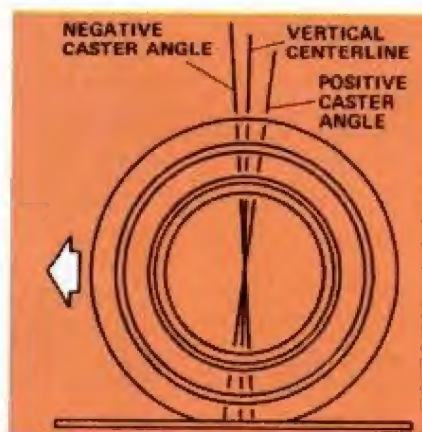
Front-end alignment service involves the checking of camber, caster and toe-in. A front-end specialist should also give the entire steering and suspension a thorough examination for loose and worn parts.

Camber is the outward or inward tilt of a wheel at the top. It is measured in degrees which represent the amount that the centerline of the wheel is tilted from true vertical.



When the camber of a car's wheels is properly set, the road contact of tires is brought more nearly under the point of load. Improper camber puts excessive load on the ball joints and wheel bearings, which causes the car to pull to one side and thus puts more wear on one side of the tire tread than on the other.

Caster refers to the backward or forward tilt of the spindle support arm at the top of a wheel. It is a directional control angle that is measured in degrees and indicates to what extent the centerline of the spindle arm is tilted from true vertical.



Caster has an influence on the directional control of a car by assisting the front wheels in maintaining a straight-ahead position and in returning to a straight-ahead position from a turn.

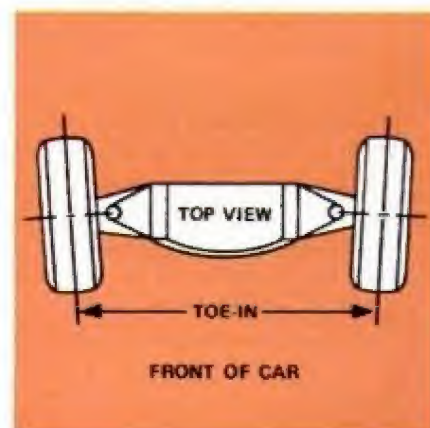
If caster is excessive, the car will pull to one side on a level road when you take your hands off the steering wheel, steering may be difficult and a low speed shimmy could occur. If too little caster exists, the car will wander and weave, thus necessitating constant

corrections in steering.

Front-end specialists use special gauges to check camber and caster. Adjustments are made on most cars by adding or subtracting shims to control parts or by turning eccentric bolts.



Toe-in refers to the distance between the front of the front wheels. It's less than the distance between the rear of the front wheels. Toe-in compensates for the tendency of the wheels to spread slightly at the front when the car is in motion. It ensures that the front wheels run parallel to each other. If toe-in is not to specification, scuffing of the tread will take place.



Toe-in is adjusted to specification with the help of an indicator and by turning the tie-rod adjusting sleeves.

SIX REASONS WHY YOU SHOULD PUT FIRESTONE STEEL RADIAL 500 TIRES ON YOUR CAR VERY SOON.

- 1 They will put steel between you and tire trouble.** Two strong belts of brass plated high tensile steel cord are under the tread to stand up to chuckholes, curbs and roadjunk.
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- 3 They'll give you better handling and steering than any conventional tire we have on the road today.** The steel belts stabilize the tread, help hold it to the road to deliver better handling and better cornering.
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- 5 Firestone gives you 7 days to test the ride.** If you're looking for a smooth-riding radial, read our offer below.
- 6 We'll help you out when it comes to paying for them.** Your Firestone Revolving Charge, Master Charge, BankAmericard, Carte Blanche, Diners Club and American Express Card are good at most Firestone Dealers and stores.



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The Steel Radial 500 by Firestone is guaranteed to give you 40,000 miles of treadwear in normal passenger use on the same car. If it doesn't, take your guarantee to any Firestone Store or participating Dealer. He'll replace the tire with a new one and give you credit for the mileage not received based on the then current adjustment price (approximate national average selling price) plus Federal Excise Tax. A small service charge may be added.

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Trade in your old tires on a set of Firestone Steel Radial 500's at any Firestone Store or participating Dealer. Drive on them for seven days. If you don't like the way they handle—or ride—return them within seven days and they'll put your old tires on again and refund your money. In full.

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Steering system service

Other than lubrication of steering linkage parts (if recommended by the car's manufacturer), a steering system requires no periodic maintenance. Whenever a steering problem occurs, you may be able to remedy the situation yourself or, at the very least, you should be able to pinpoint the troublesome area.

A steering problem will show up as stiffness in the wheel, loose steering, shimmy in the wheel, jerky steering, rattling in the steering mechanism, tire squeal on turns, or poor recovery from a turn. Before you do anything else, bring the tire pressure to specification and see if your problem disappears.

If not, your next step is to check the lubricant in the steering gear; remove the filler plug and see if the lubricant is level with the filler-plug hole. If it isn't, fill the steering gear with a gear lubricant.

Your next move is to find out if the steering linkage requires lubrication. Consult your service data. If lubrication is recommended, wipe dirt from around the ball-joint plugs, remove the plugs, install grease fittings and grease as was described in the section dealing with lubrication. Perhaps the cause of the trouble exists in the steering gear itself. To find out, jack up the car (keeping safety in mind) and turn the left front wheel to its extreme "out" position. Now, slowly move the wheel back through its travel, feeling for roughness

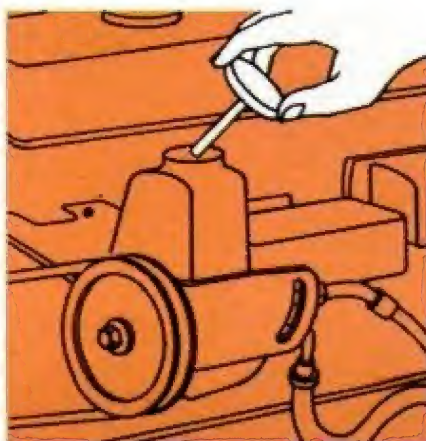
or jumpiness. Movement should be smooth. If it isn't, damage may exist in the steering gear requiring an overhaul or replacement.

Keep turning the wheel slowly through its straight-ahead position. A slight drag or tightness should be felt as you do. If there is no drag, have a mechanic adjust worm-bearing preload, and the sector and ball-nut.

Beneath the car, examine the end of the pitman-arm shaft for an excessive amount of grease which could mean that the shaft grease seal has ruptured and needs to be replaced.

Starting at one end and working across, grasp and try to move the tie-rod, idler arm, intermediate rod, pitman arm and the other tie-rod. If you should discover any movement in any of these parts, that part should be replaced.

The power-assist unit for steering is one of the most reliable parts of a car and requires practically no service. However, it is important that you periodically check the fluid level in the pump reservoir. If more fluid is needed, add power-steering fluid—no other.

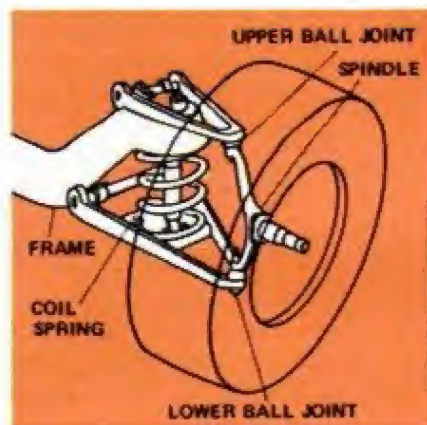


Another part of the power assist that requires looking at, literally, is the drive belt. Be sure it isn't cut or glazed, and see that it's adjusted properly. Drive belts should have no more than one-half inch of play.

If a car with power steering becomes hard to steer or noise develops in the system and a fluid and drive-belt check fails to solve the problem, consult a professional mechanic at once.

Suspension System Service

Suspension system components that require periodic checking are shock absorbers and ball joints.



Shock absorbers are hydraulic components that assist in the stabilization of the car. Their job is to reduce vibration and stop body roll. Thus, if your car should develop a severe body sway, front-end dip during braking, vibration or a "bouncy" ride, you may well suspect shock failure.

Badly worn shock absorbers can also be the cause of irregular tire wear. Chassis noise (rattle or "clunk") is still another indication of shock failure.

There are several ways for you to determine if an

instability is being caused by weak shocks. One way is to put your car through a tight turn. If excessive sway is evident, then your shock absorbers have probably reached the end of their serviceability.

For another test, try leaning on the front end and then on the rear end of the car to get it bouncing—then stop. If the car should continue to bounce for two or more times, that's proof the shocks are not doing their job of damping the vibrations.

Whenever you are servicing your car from underneath, check each of your shocks for signs of leaking fluid. If you should notice a fluid leak, that shock will have to be replaced.



Another test is to grasp each shock and try to shake it. If a unit should move at all, tighten its mountings and try to shake it again. If there is still some movement, bushings are worn. Some of the bushings can be replaced, but others are an integral part of the shock. When they wear, the shock has to be replaced.

If you find that one shock absorber has gone bad, it's

best to replace the other unit on the same axle. Replace front and rear shocks in pairs.

Replacing shocks isn't a difficult job in most cases. Units are fastened at the top and bottom. Liquid "nut-busters" that help to break loose stubborn fasteners and other helpful hand tools are available from the parts and accessories dealer who supplies your new shocks. He can also assist you in selecting the right shocks for your particular model car.

There are two suspension ball joints at each front wheel which provide steering stability through all pivoting and turning motions. They are subject to damage by continuous pounding, movement and exposure

- ★ *Family sedan*
- ★ *Pick-up truck*
- ★ *Mini-car*
- ★ *Motorhome*
- ★ *Power boat*
- ★ *Van*
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DAN GURNEY TALKS ABOUT BRAKE FLUID



**Dan Gurney,
car builder
sportsman.**

If you're wondering about the best brake fluid to use for your car or truck, here are a couple of ideas. First, look for a minimum dryboiling point of 450°F as set by the Department of Transportation DOT 3 specification. Second, whether you have a drum, disc or combination system, there's one brand that's excellent for all three: X.H.D. 450 Brake Fluid. It was developed with Dow research, working with automotive factory engineers, to meet or exceed DOT and SAE specifications. Better yet, it was designed for compatibility in all braking systems. You not only can't go wrong with Dow brand X.H.D. 450



Brake Fluid, you can't beat it for quality and safety-proven performance.



Hot weather reminder: protect your engine cooling system against boil-out with a 50-50 solution of Dow Super Coolant Antifreeze. Before you buy any coolant antifreeze, compare... I'm sure you'll buy Dow!



Dow makes a science
out of caring for your car.

*Trademark of The Dow Chemical Company

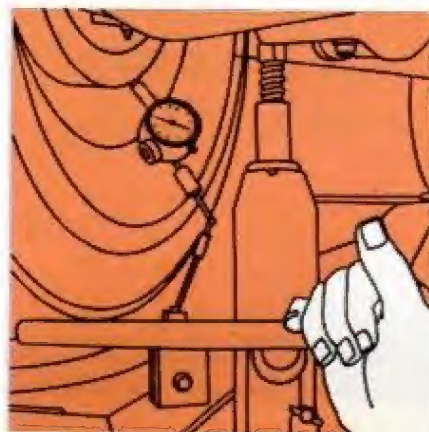
to dirt and moisture.

Ball joints may be bad if you note any of these signs: excessive play in steering, tires become scuffed or cupped, front wheels start shimmying, or wander occurs. See if any grease is oozing from a defective seal. If so, the ball joint has been exposed to grit and should be replaced.

Ball joints should be checked for looseness (due to excessive wear) when danger signals arise. In most cases, this involves jacking up the car properly and having the joints tested with a professional indicator for more-than-specified movement. (Ball joints used in most 1973 cars are equipped with built-in wear indicators.)

If you determine that ball joints are worn, but not worn beyond tolerances specified by the manufacturer, you can use a do-it-yourself ball-joint repair kit. The kit consists of a compound that is injected into the loose ball joint, and a disposable injector gun.

Don't put off testing a car that shows signs of worn ball joints. A wheel could collapse. For ball-joint lubrication (if it's necessary) see Section 2—Lubrication.

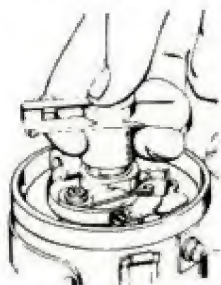




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All you need is this book and a few basic tools to

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- make your car run longer, run better
- save on gas, oil and lubrications
- take pride in your accomplishment



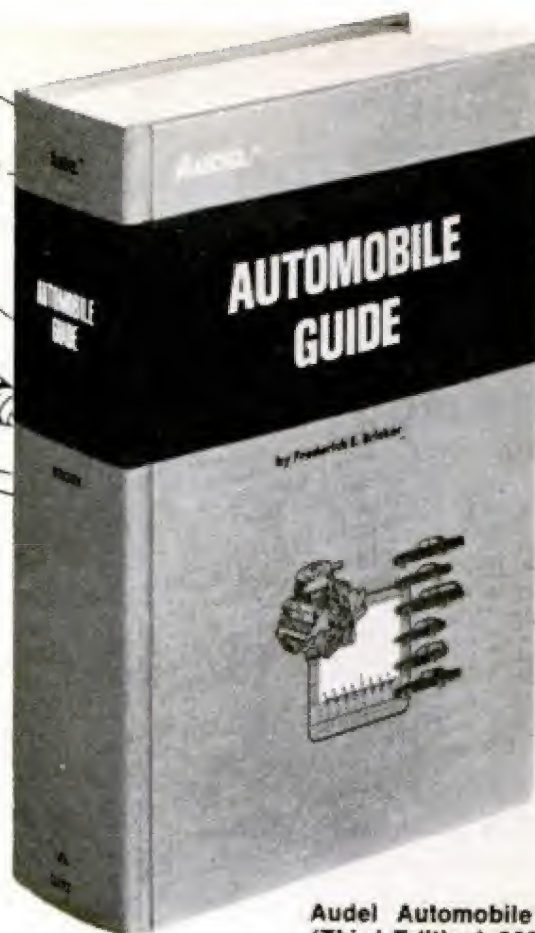
This easy-to-read, easy-to-understand book strips away the mystery of automobile repairs and guides you step-by-step through each procedure.

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Popular Mechanics Car Care Guide



6 BODY CARE

No matter how mechanically perfect a car happens to be, it seems to run better when it is clean. Most drivers agree they get the greatest pleasure from a car when it runs well and looks as if it just came off the showroom floor.



A good wax job at least once a year keeps a car looking new. Every car owner believes his method is surefire, so there are as many staunch believers as there are products on the market. All agree the finish must be thoroughly cleaned before rewaxing. If you wax over grime and oxidized paint, your work is futile;

you won't bring out the true luster and the wax job won't last long.

There are confirmed believers in paste wax and elbow grease and they have good results to show for it. But there have been a lot of improvements in car waxes and polishes. There are new cream and liquid waxes that go on easily and need little or no buffing. Experiment a little to find the kind you like best. It will pay off in less work and a longer lasting shine.

A "clean" car is something more than a clean body. "Clean" also means that the body is free of damage, it is noiseless and sealed from drafts and water leaks. It means a spotless interior and engine, too.

What's involved in producing the clean car? Well, if you recently had the misfortune to get an estimate from a professional for repair of minor body damage (dents, rotted-out area, scratched paint and the like), you now know that minor damage draws major prices. Car owners are paying \$50 to \$75 just to have small dents knocked out and repainted.

The solution to paying professionals outrageous fees for producing a clean car for you, of course, is to do the work yourself, using products sold by automotive parts and accessory dealers. Auto-body repair kits and touch-up paints, for instance, are so good and easy to use that the results will equal those obtained if the job had been done professionally.



Other clean car products you'll find at an auto parts and accessory shop include vinyl-top cleaners and color restorers, chrome cleaners, upholstery cleaners, engine cleaners, undercoating, windshield sealers and weatherstrip cement.

It isn't possible here to discuss in detail every aspect of producing a clean car. However, major areas are discussed that touch most bases. They are body repair, tracking down and getting rid of body noise, cleaning the interior and cleaning the engine.

If your specific problem isn't covered here, consult your parts and accessories dealer to find out what's available that will let you solve the problem yourself inexpensively.

Body repair

You can repair dents in the body of your car, except when a whole area is folded like an accordion. Auto-body plastic filler allows filling of a dent instead of pulling it back into shape as the body shops do.

(The steps outlined here are those required by one manufacturer of auto-body plastic filler. Because there may be variations required

**Motor oil
Motorcycle oil
Racing oil
Outboard oil
Snowmobile oil
Transmission fluid
Lubricants**

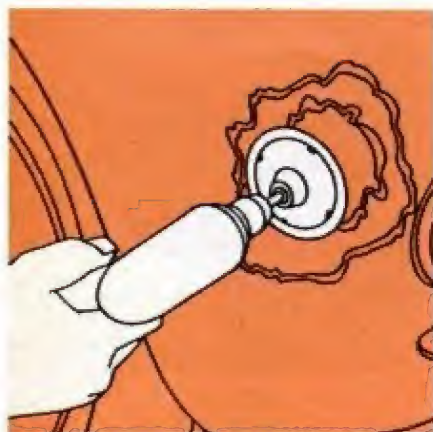
Pennzoil has something for everybody.



Whatever you drive, wherever you go, Pennzoil is worth asking for.

by the material you use, please read instructions provided by its manufacturer and follow them carefully. Our intent is to show how simple it really is to repair minor body damage.)

The first step is to prepare the surface. Using a $\frac{1}{4}$ -inch electric drill or a power sander equipped with a No. 16 or 18-grit sanding disc, sand the damaged area until paint is removed to the bare metal. The sanded spot should have a diameter at least 1 inch larger than that of the dent.



If the dent is deeper than $\frac{1}{2}$ inch, drill $\frac{1}{8}$ or $\frac{1}{4}$ -inch holes in it, spacing the holes $\frac{1}{2}$ inch apart. This is done so the plastic filler will affix itself solidly to this relatively deep area. It isn't necessary to drill holes if the dent is less than $\frac{1}{2}$ inch deep.

Mix the auto-body plastic filler as instructed by the manufacturer. Using a putty knife, apply a layer of the filler to the area. With a rubber squeegee, spread the filler and mold it to the contour of the area. Be sure to cover the entire bare spot. Knead the material back and forth to assure firm adhesion.



Let the material harden. It takes about 20 minutes. Then, using a grating tool of the kind show below, which is available from auto parts and hardware dealers, shape the repair and remove excess filler.

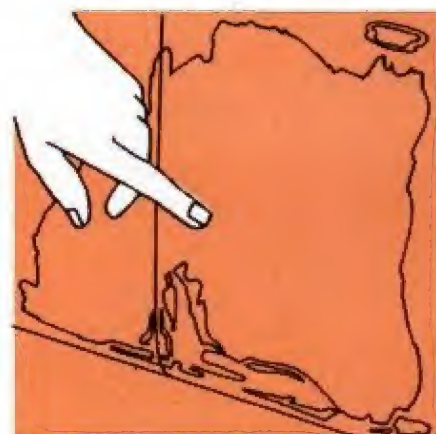


Sand the area with No. 36-grit production sandpaper, followed by another sanding with No. 80 or 100-grit sandpaper. The area is now ready for painting—a simple task that we'll discuss shortly. Before we do, let's sum up how to get rid of body rot. Start by breaking out rotted sections. Sand the area with No. 16 or 18-grit sandpaper. This will leave a smooth area surrounding a gaping hole.

One way of "filling" the hole is to press adhesive-backed aluminum tape over it. Make sure the edges are pressed firmly down.



With the tape in place, cover the area with auto-body plastic filler as you did above to fill a dent.



Once an area is dented or rot begins, the integrity of undercoating has been lost. But, an undercoating compound available in spray cans is applied easily to the underside of the damaged area after repair. It will also cover spots missed in an undercoating job.

As for painting repaired spots and getting rid of scratches, auto parts and accessories dealers have a full assortment of touch-up products that make it easier than ever to restore marred finishes. Get the one that matches your car's color—check its identification plate, usually found on the firewall or door pillar.

The illustration here shows what a typical identification

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You already have the skill to refinish those damaged surface areas which ruin your car's looks. The only thing you may need is instructions. We'll send those to you—no purchase necessary. They are brief, illustrated, uncomplicated, and complete. A few minutes practice on a tin can is all you'll need.

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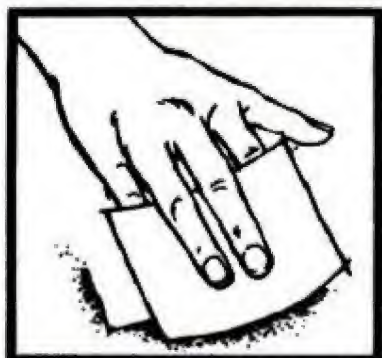
original color exactly. Dries in minutes to a hard high-gloss finish. Beautiful! Professional!

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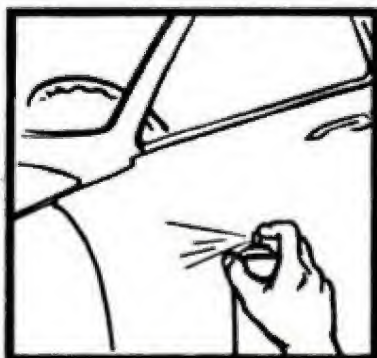
Put your skill and more than 30 years of Dupli-Color® experience to work this weekend.

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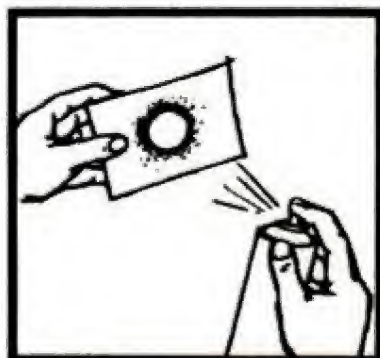
Complete instructions on every can, but we'll send an instruction booklet if you'd like. It tells the tricks of the auto refinishing trade. For your copy, please check the Dupli-Color listing in the "Worth Writing For" service of this issue.



SAND LIGHTLY. Use No. 400 wet-or-dry sand paper. Fold small square piece, gritty side out. Hold sand paper as illustrated before using Dupli-Color®.



SPRAY EVENLY. Hold Dupli-Color® spray can 8 to 10 inches from surface. Spray fast, smooth side-to-side strokes. Apply several thin coats in one minute intervals.



SPRAY SHIELD TECHNIQUE. For touching up a small nick or scratch. Cut small hole, similar in size and shape to nick, and spray Dupli-Color® through hole.

DUPLI-COLOR®

PRODUCTS

1601 Nicholas Blvd., Elk Grove, Illinois 60007

plate looks like. This one is Oldsmobile's.



Get the paint color number from this plate and take it to your parts and accessories dealer who will use a code book to match the number to paint. The cap on the paint can will show the color. It may also specify the make and model of the car, as well as the paint code number.

You should also buy a primer that's compatible with the paint. A lacquer paint requires a lacquer primer . . . an enamel paint requires an enamel primer.

Touching up a scratch so that it doesn't appear to have been touched up can be done like this:

1. Wash the marred area with plenty of clean water. Wipe it dry with a soft, clean cloth. Once the area has been cleaned, don't touch it—not even with your hands. If you do, it should be washed again.

2. If you are painting an area that hasn't already been sanded—one which hasn't been repaired with auto-body plastic filler—sand the spot lightly, using No. 400 wet-or-dry sandpaper. No other grade of sandpaper should be used.



Fold the sheet, tear it into four pieces, hold one as seen above (gritty side out) and dip it fully into a pail of clean water. Squish it around. When this is fully soaked (it can't be too wet), sand spot lightly. Smooth the scratch to a feather edge.

As you proceed, dip the sandpaper frequently in clean water. When you have an area in which the center of the scratch is sanded deepest and the rest of the area tapered gradually into the original finish, stop sanding and wash area with plenty of water. Dry with clean, soft rag.

3. To keep paint off glass and chrome next to painting area, cover them with newspaper and/or masking tape.

4. Prime bare metal (or the repair you made with the auto-body plastic filler). Primer protects metal from rust, keeps the new finish from peeling and levels out the damaged area to be even with the original finish.

Carefully read and follow directions on primer and finish paint cans. When the primer dries, sand as above, but do not feather edges. Just sand the spot lightly so it evens out with the surface of the surrounding finish.

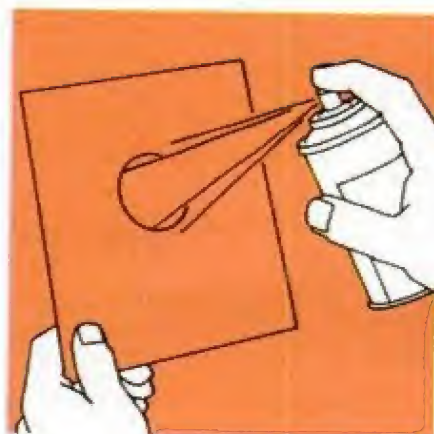
5. Apply the finish coat,

but go easy. A heavy coat will run and sag. Apply several thin coats instead.

Hold spray can 10 to 12 inches from the surface and spray across and back once or twice with quick, smooth strokes. Keep the can moving. Wait 30 seconds or so between applications. Follow this pattern until the area looks good to you.

Shake paint cans vigorously a minute before use, and occasionally while painting.

To control spray when touching up small scratches cut a small hole in a piece of cardboard and direct the paint through this shield.



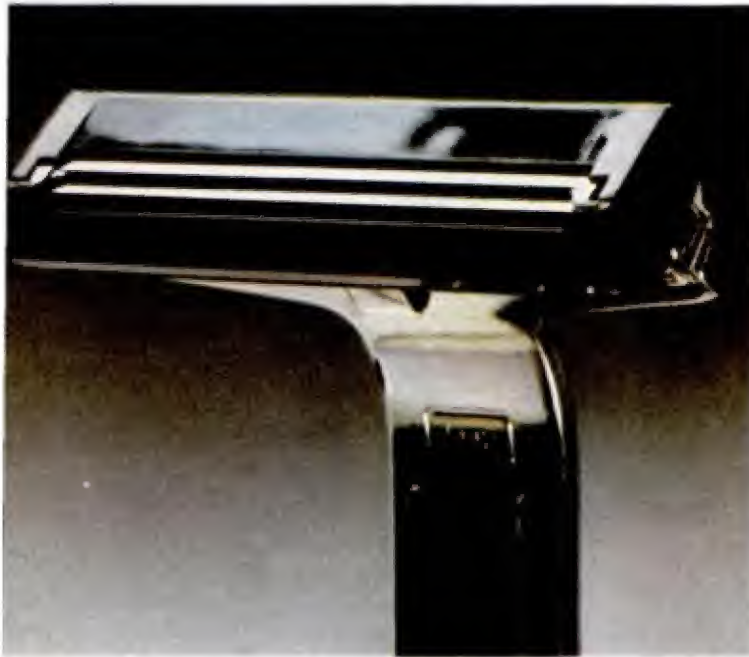
If you have never had experience in using spray paint, practice on a tin can before tackling a fender.



6. Let the repaired area dry for a week. Then rub it lightly with an auto-body

Schick Super II

against I.



How double is a double edge razor, really?
There's never more than one edge working for you. While the other one's out there goofing off.

Now compare with the Schick Super II:
Both edges are on your side. Always working together.

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Schick II
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The Schick Super II. Put both edges on your side.

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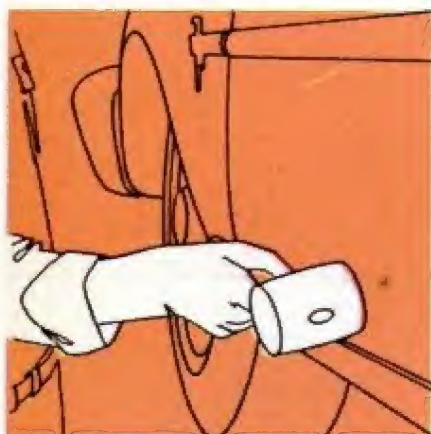
rubbing compound to blend it with the paint. Keep your car looking new with stain removers, polish and car wash available from your parts and accessories dealer.

Quieting noise

Noises produced by a car body include rattles, squeaks and squeals associated with loose parts, and hissing associated with wind. To quiet noise, you first must find the cause. That done, the cure is usually cut-and-dried—such as tightening this or that, or replacing a piece of weatherstripping.

Suppose your car has a rattle. It could be that a nut or bolt was left inside the door well when the car was built, or a trim fastener may have worked loose.

One way to find a rattle is with a rubber mallet. Start at one end and gently tap the car over its entire surface. Don't miss a spot.



Tighten bolts in the area where you hear a rattle. If inside a door well, you'll have to remove the trim panel to get at the source of the noise.

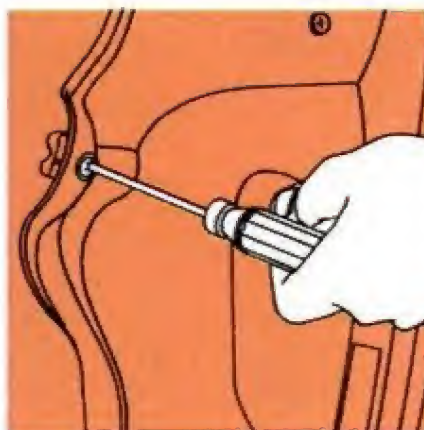
A noisy, vibrating window is caused by a worn-out window regulator or loose or worn weatherstripping.

To check a regulator, tap the trim panel with a rubber mallet. A rattle means that regulator rivets or bushings are probably worn. To stop window vibration, have the regulator overhauled.

If weatherstripping is loose, pull it from the channel and wash its back surface and the channel with cleaning solvent. Coat both surfaces with weatherstrip cement, let it get tacky and press strip into the channel. Replace any worn-out or damaged weatherstripping.

For body rattles or squeaks that can be quieted by proper lubrication, see Section 2. In some cases, lubrication will work; in others, different solutions are necessary, as with moldings that can be filled with caulking compound. (Be wary of sharp edges often found on molding strips.)

To remove, pry a strip off its clips, but be aware that strips are often held by screws at one or both ends and by clips in the middle.



After removal, fill the molding's hollow back with automotive caulking and reattach to car. This will stop wind-created swoosh.

To check loose weatherstripping for noise,

apply masking tape along edges of a window or door and road-test again. If noise stops, reseal or replace the faulty weatherstripping.

A loose part, such as a parking brake cable, tailpipe



or license plate, will cause noise. Check any part in near contact with the body.

Cleaning up

To clean the interior, vacuum loose dirt from seats and floor. If upholstery needs shampooing, you'll see many good cleaners at auto parts and accessories dealers.

A commercial stain remover usually removes upholstery stains. Stubborn stains may need a volatile cleaning fluid. Follow precautions on label. First, scrape off as much stain as you can. For ice cream and candy stains, rub with a cloth soaked in very hot water. Treat chocolate with warm water; blood or vomit with cold water. If gum gets on upholstery and is still soft, put an ice cube on it until it hardens and scrape off the excess.

Cleaning fluid is toxic. Use it outside and keep car doors open. Dissipate the fumes by directing air from a fan across the stain.



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Maybe you've seen the commercial on television.
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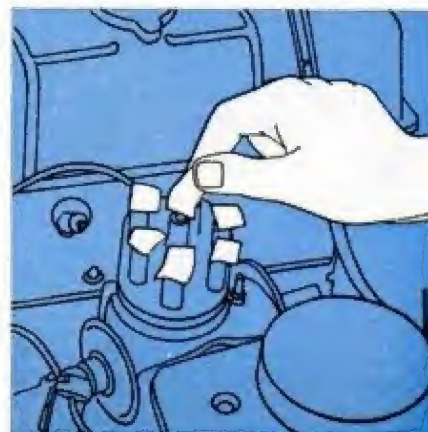


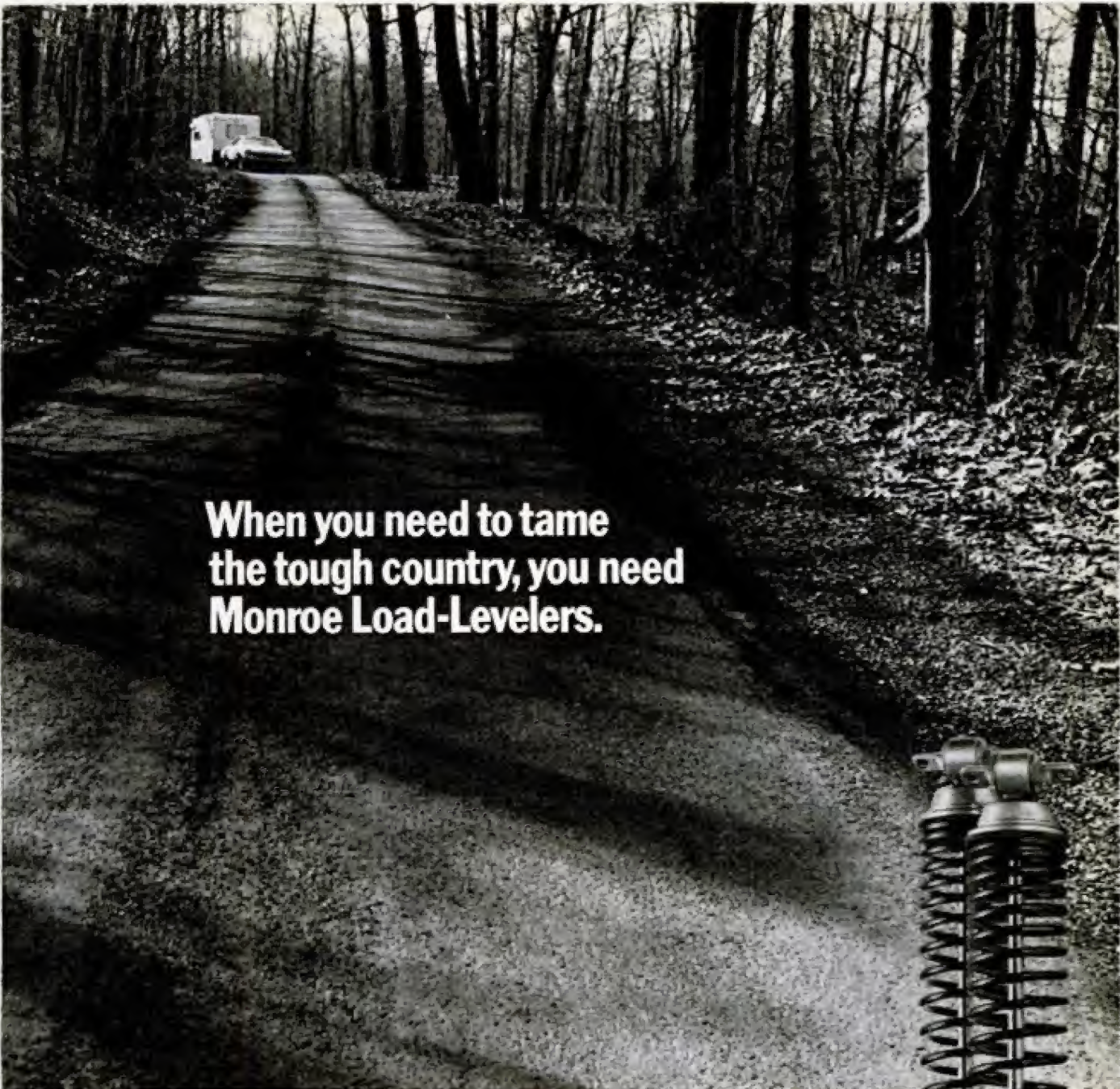
Moisten a clean pad with cleaning fluid and rub the stain gently in a circular motion. Wait several minutes between applications. Test cleaner on piece of hidden upholstery to check that it doesn't discolor the fabric.

Products to help you maintain a vinyl top include protective waxes, cleaners to remove grime, black wax to revive a black top, neutral wax to revive white and colored tops.

To help restore the new look under the hood, buy an engine degreaser. Keep the battery cables disconnected until cleaning is done. Engine cleaner is flammable; it must not be introduced to sparks or flames.

Remove sparkplug-to-distributor cap and coil-to-distributor-cap cables. Clip a numbered clothespin to each cable to identify it. Cover each distributor cap





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hole with masking-tape strip numbered to correspond with number on the clothespin. It will be easier to put each cable back in place.

Cover the distributor cap and oil filler cap with polyethylene sandwich bags to protect them. Remove the carburetor air cleaner and clean the metal parts. Use an old toothbrush and grease to clean the outside of the carburetor and linkages. Cover the carburetor with a cling-type of household plastic wrap.

Scrape off caked dirt with a putty knife and apply engine cleaner, following the directions appearing on the can.



Let the engine cleaner do its job. Then, using a garden hose, blast away the grease and grime.



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What they do.

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A good year-round coolant/anti-freeze gives you three-way protection—protection against overheating, freezing and corrosion.

ZEREX® goes one step further. Only ZEREX has patented anti-leak to stop most common radiator leaks.

Why is this four-way protection important?

OVERHEATING. A coolant/anti-freeze raises the boiling point of your cooling system...a "must" to prevent boilover in today's bigger, hotter-running engines. All major car manufacturers recommend use of a coolant/anti-freeze year round. **CORROSION.** A good coolant/anti-freeze contains chemicals to inhibit or stop corrosion and rusting of cooling-system metals...a "must" to maintain efficiency and prevent clogging.

FREEZING. A coolant/anti-freeze lowers the freeze point of your cooling



system in proportion to the concentration...a must for winter driving. A 50/50 solution usually is adequate; a 70/30 solution is the maximum recommended.

LEAKS. All of your protection is lost if your coolant/anti-freeze leaks out. Only ZEREX has patented anti-leak to stop most common radiator leaks. Year-round protection that won't run out on you.

FLUSHING. If your present coolant has accumulated rust and dirt, flow can be reduced and may cause overheating and boilover.

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Ready to sand in 20-30 min. Won't crack or shrink. 6-pc. kit: filler, cream hardener, applicator, fiberglass screening, sandpaper. **2.44**



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Pressure washer has big detergent reservoir. Washes with powerful jet spray, scrubs off stubborn grime with scratch-free brush. Ideal for car, boat, windows.

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CAR CARE MONTH

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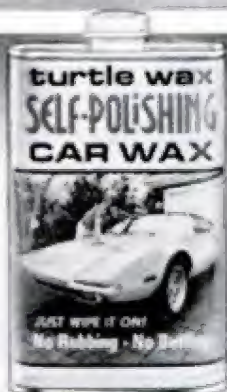
1.29



Deluxe Pump

Heavy-duty air pump made of 25% heavier steel. 1-pc. unbreakable iron base, brass-plated cap. Vertical hose mount prevents snapping off. 24" hose, 18x1¼" barrel.

3.88



turtle wax Self-Polishing Wax

Just smooth it on, wipe it off. Leaves a brilliant, tough protective finish without buffing or rubbing. One pint liquid.

1.22



Silicone Auto Lube

It's paintable. Stops squeaks and friction, lubricates and protects almost any material at all temperatures. 6-oz. aerosol can.

88c

4250 True Value Hardware Dealers who own their stores, set their prices and reserve the right to limit quantities. Prices may vary and are subject to change without notice, available at many other hardware stores. For honest values and better service... shop at a hardware store. Prices expire June 15, 1973

Popular Mechanics Car Care Guide



7 PLUS other know-how you need to keep your car in perfect condition

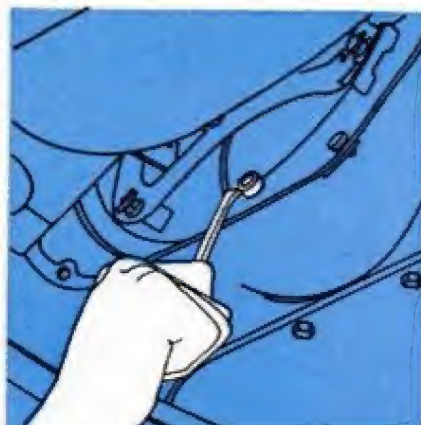
There are many other maintenance jobs you can do yourself. The more you do, the less you'll be dependent on shops for whom your car is just another job. Those whopping repair bills list parts and labor, but not tender loving care.

Automatic transmission. Most manufacturers say that the transmission should be drained of old fluid and a new filter installed every 24,000 miles, but check the recommendation of your manufacturer to be sure. In addition, some recommend that the bands be adjusted at that time.

If you don't know how to adjust bands and don't have a torque wrench, leave this to a professional. However, you can save the cost of having him drain fluid and replace the filter.

Fluid must be drained from the torque converter and from the body of the

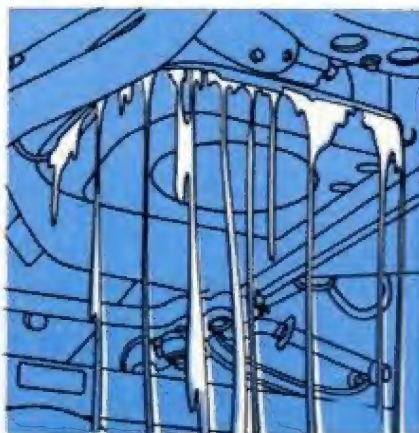
transmission. The converter is the bell-shaped housing at the front end of the transmission pan.



To get at the drain plug in the converter, you usually have to remove a plate covering the plug. Then you may have to crank the engine a couple of revs so the plug drops to the opening. Remove the plug with a socket and allow the old fluid to drain. Reinstall plug and plate.

Some transmission pans are equipped with a drain plug. If yours has one, remove it to allow the fluid to drain.

Other transmissions don't have drain plugs. You have to unscrew the bolts of the pan part way and break the cover loose from the case, which will allow fluid to drain. Kind of messy, but you have no choice.

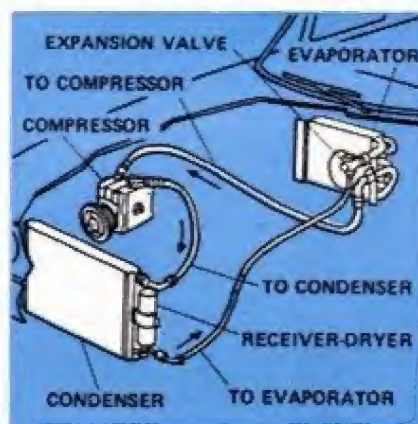


Whether you use a drain plug or drop the pan, the pan has to be removed after the fluid drains. Don't worry about saving the pan gasket. All the care in the world won't help. You'll have to use a new gasket.

Clean the pan thoroughly with a solvent, such as kerosene. Now, unscrew the old filter from the transmission and replace it with a new one. Reinstall pan, using a new gasket, and fill transmission to the FULL mark on the transmission dipstick. You'll probably need a funnel. Use only the highest quality automatic transmission fluid.

Airconditioning. Although you may not think so, you can help assure the efficiency of your airconditioning system. Some maintenance and diagnosis of problems can be performed in the driveway, but usually repairs have to be made by a professional serviceman.

The airconditioning system in an automobile consists of a condenser, compressor and evaporator that will function on power taken from the engine by means of a drive belt.



The condenser cools heat-laden, vaporized



KONI Super Shocks.

Engineered to replace standard units when improved road-holding, cornering and handling are desired.

Enjoy cat-like traction, with "bolt-on" KONI shocks. KONIs give you that **extra** control, stability and comfort at all times. Only KONI's competition tested and proven shocks offer a patented adjusting feature that will compensate for eventual wear.



Husky, hard chrome plated steel piston rod with corrosion resistant finish



Inner cylinder and shock housing of heavy gauge drawn steel



Internal piston precision machined of solid steel and lapped to aircraft tolerances



Triple sealed inner chamber with patented self-expanding rod seals that automatically compensate for wear



Long wearing, accurately molded mounting bushings.



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refrigerant returning from the evaporator. As it cools, refrigerant condenses to a liquid state and is directed back to the evaporator.

On its way, it passes through the receiver-dryer. This small tank holds the refrigerant until it has to be transferred to the evaporator.

The expansion band controls the amount of refrigerant that's allowed to flow through the system at any one time. The expansion valve is controlled by the driver via the airconditioner's temperature-control knob.

Refrigerant passing through the evaporator cools the car by drawing off heat. The compressor pumps refrigerant around the circuit.

If your airconditioner stops working or doesn't cool efficiently, here are several things to do before seeking professional help:

- Make sure you operate controls properly. Follow owner's manual instructions.

- You can't often tell if a fuse has gone bad by looking at it, so replace fuses. An airconditioner usually has one or two 30-ampere fuses. One is practically always in the car's main fuse panel, often found beneath the dash on the kick panel. Many cars have a second airconditioner fuse that's often hard to find. Try to get a schematic of the airconditioner circuit.

Write the manufacturer, if necessary. The second fuse may be located in a holder in the engine compartment.

- Use a soft bristle brush to clean out bugs, leaves and other debris from the

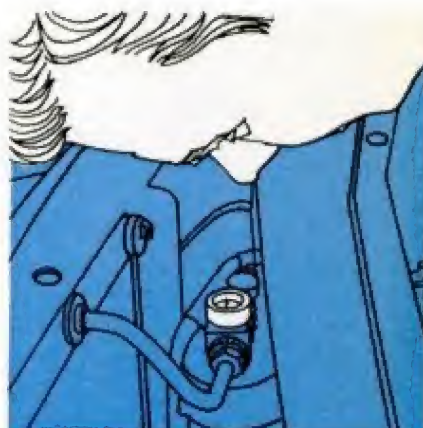
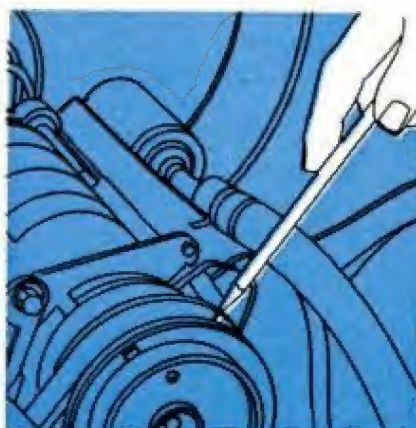
condenser core. If the core becomes clogged, cooling will be reduced.

- Examine the compressor drive belt. If it is glazed, worn, cut or cracked, replace it. Start the engine and turn on the airconditioner. If the belt is loose and slipping, the compressor pulley won't turn, or it will turn and stop. Tighten the belt.

- With the airconditioner

running, check the compressor's magnetic clutch—the inner part of the compressor pulley (below, center column). If the clutch isn't rotating, it may have to be replaced.

- Let the engine idle and set the airconditioner for maximum cooling. Look into the sight glass of the receiver-dryer. If you see bubbles, the system will have to be recharged.



MAKE CONTACT

Phffft! Spray on the new GE Silicone Battery Care and you'll get fast, fast, fast relief for dirty terminals. And as it provides strong cleaning action, it also leaves a coating that waterproofs terminals and prevents further corrosion. In fact it's the only spray that cleans and protects in one operation. And one phffft lasts and lasts and lasts and lasts. So get it at your automotive counter.



GENERAL  ELECTRIC

Smokey Yunick Says . . .

"Twisting Screws May Not Be Enough For A Good Tune-up"

I get thousands of questions every month from my automotive column . . . many describe engine performance problems which cannot be solved by twisting screws. Often these problems are caused by varnish and gum on rings and valves which cause uneven compression, misfiring and a general inability to get a good tune-up.

In today's engines with anti-pollution gear, it's imperative to maintain a clean engine. Oil will not last as long under the dual punishment of more accessories and anti-pollution devices. It follows that oil thickening, gums and varnish will occur faster than in past years. Going beyond the recommended oil change period may clog up your engine. Changing to fresh oil doesn't make it right either. The stuff is there waiting to foul up something.

Rislone is a solvent-dispersant. It dissolves polymerized hydrocarbons (varnish), and gums . . . actually these are the olefins which are the microscopic balls which separate metal from metal in any lubricant. An oil and filter change, along with a quart of Rislone, can give the engine a fresh start. Making use of the detergents in modern oils, and the solvent dispersant characteristics of Rislone, can keep engines clean for good performance and minimum pollution.

That's why Rislone is called an Engine Treatment, not an oil additive. It's simple objective is to get rid of the gum and varnish that alter tolerances and interfere with ring and valve seal so that compression and vacuum are brought back toward normal.

I think that if you add Rislone before tune-up and a hundred miles before each oil change, you will like the results!

Send large, self-addressed stamped envelope for Smokey Yunick's Lube Tips.



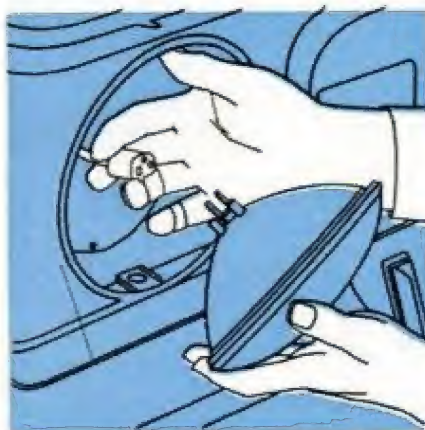
**POPULAR
MECHANICS
PRODUCT FEATURE**

The Shaler Company, Waupun, Wisconsin 53963

You can recharge your air-conditioning system yourself with an inexpensive kit consisting of refrigerant, recharge hose, tap valve and leak detector. If you leave recharging to a serviceman, make sure he checks the entire system for leaks.

● Look for openings in the firewall that allow hot air from the engine compartment into the passenger compartment, thus reducing cooling. All holes should be filled with automotive caulking compound.

Lighting system. Check for burned-out headlamps, parking lights, front and rear side marker lights if present, taillights and license-plate lamp. To take off a burned-out headlamp, remove the bezel and screws holding the lamp and pull lamp from its connector.

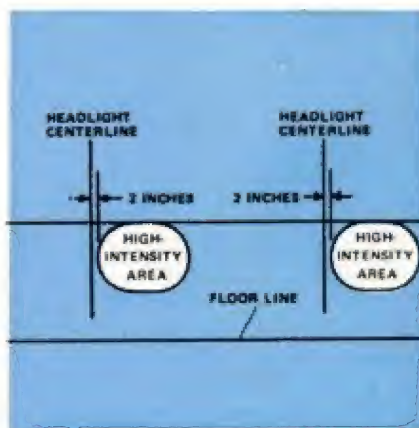


When buying replacement headlamps, make sure you get those of proper size and specifications for your car. Compare prices of different makes of lamps and look for "extras" like an extra filament that glows after your sealed beam burns out—providing oncoming traffic with a dim, yet full, profile of your car.

Adjust your headlamps so

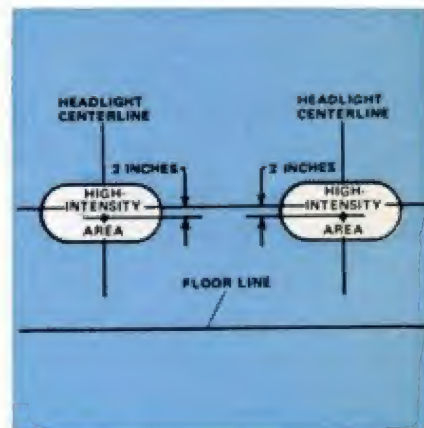
they're properly aimed: not so low that you override them or so high that they blind other drivers. Check your state's requirement for aiming, and if you have your headlights accurately adjusted during an annual state safety inspection, make a note of the setting and keep them that way.

A do-it-yourself check can be set up by drawing a pattern on a wall or garage



door. The car must be placed on a level surface 25 feet from the wall or door to make the adjustment.

First, adjust the low beam (below, center column). Then check the high beam adjustment pattern.



Lights of most late-model cars can be adjusted using headlight adjusting screws accessible through the bezel, or using the adjust-



DO IT YOURSELF

Make your own auto gaskets. Quickly. Easily. Professionally. And with just this tube of new GE Silicone Instant Gasket. Developed for the auto industry itself, it replaces cork, felt and other old-fashioned gasket materials. Seals more surfaces than the others too. Withstands temperatures as high as 600°F. And fights oil, transmission fluid, water and antifreeze. It's amazing, really. And you'll find it at auto counters now.



GENERAL  ELECTRIC



What's the younger generation coming to?

Plenty, if they have the savvy of young Pete Kaldis. At age 27, Pete operates one of the biggest car-care centers in Houston. It's Kaldis Gulf Car Care Center, a three-acre spread that includes six service bays. And 44 very busy people.

"There's a lot at stake here," says Pete. "You can't afford to have any complaints. I also believe

some of the old ideas are kind of obsolete." For example, Pete believes that just because a car comes in with its original-equipment spark plug brand, that doesn't necessarily mean it's going to run better with that brand.

Pete's tune-up customers clearly agree. Because they are some of the 22 million people who have switched to Champion

spark plugs. Pete has switched too. In his Chevy pickups and Ford Pinto, plus his personal Lincoln Continental Mark III. "I stock only Champions because I know Champion will do the job as well, if not better, than other brands. In every car."



Toledo, Ohio 43601

Better plugs for everyone.

ment knobs behind the lights under the hood. If not, you must remove the bezel to get at adjusting screws.

To replace burned-out parking lights in some cars, remove the screws holding the lens or reach beneath the bumper for the bulb.

A burned-out front side marker can usually be reached from beneath the fender or by removing a lens held by screws. Replace burned-out rear side markers and taillight bulbs from inside the trunk or by removing lenses held by screws.

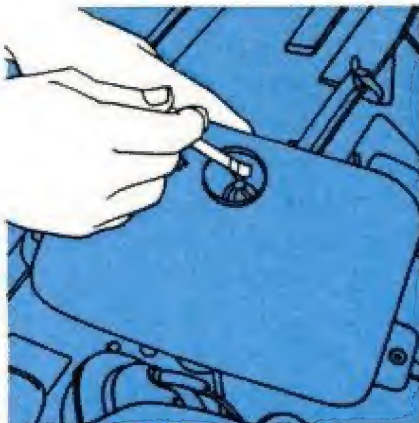
Check the license-plate light and step on the brake to see if stoplights work. Place transmission in reverse to see if backup lamps light. Test each turn signal and hazard-warning flashers if you have them. If a signal fails to function, replace the bulb. Chances are that the cause is a burned-out filament.

Wipers and washers. Replace deteriorated windshield wiper blades. Push old blades out of wiper arms, click new ones into place.

If windshield-washer fluid doesn't eject forcefully or squirt at all, make sure the reservoir has fluid. Fill it, if necessary, with two parts of water to one part of fluid when temperature is over 32° F. If below, use a 1-to-1 proportion.

If the reservoir is full but fluid action is sluggish, clean out holes of the washer lines at the windshield with a pin or thin-gauge wire. You'll find the line protruding at the base of the windshield, pointing at the glass.

Perhaps the reservoir filter needs cleaning. Remove the reservoir and pour its fluid into a clean container for reuse. Clean the strainer at bottom of the reservoir or end of the

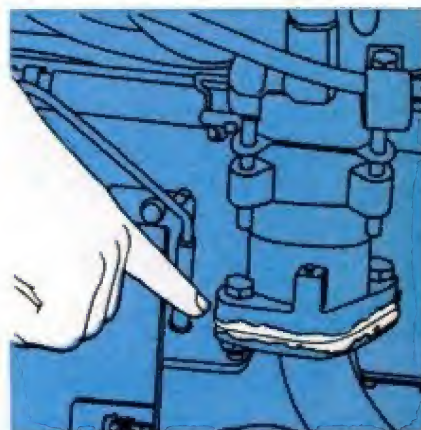


delivery hose with a small brush. A clogged strainer blocks the flow of fluid.

Exhaust system. A leaking exhaust system is a serious hazard. Closely examine the

muffler and pipes for holes and rust. Tap each part lightly with a wrench. It should "ring." If it clanks dully or is damaged don't take chances—replace it!

Start engine and examine all clamped joints for leaks. Begin at the exhaust manifold-exhaust pipe joint connection. Most times when there's a leak here white deposits resembling corrosion are forming.



RAINCOAT IN A CAN

Even in wettest conditions, GE Ignition Protector keeps ignition wires, spark plugs, coil connections, distributor caps and battery terminals dry. Phffff! One spray does it. Waterproofs. Seals out dirt. Fights corrosion. Does it all. And since it's silicone, it lasts. So get it at auto counters. And get one sure start after another and another and another.



GENERAL  ELECTRIC

If there is a leak at the exhaust manifold-exhaust pipe joint connection, the gasket is bad. Loosen the bolts and remove the old gasket. Put in a new one, coat the joint with exhaust-system joint connection and retighten the bolts securely.

With the engine running, place your hand at other exhaust-system joints. If the joint leaks, you'll feel puffing. Loosen the clamp, coat the joint with exhaust-system joint connection sealer, slide the clamp back over the joint and tighten firmly, but don't overtighten or you'll crush the pipe.

Stereo tape. If your car is equipped with a stereo tape deck, buy a tape head cleaner cartridge and use it at least once a week. You

insert it into the player just like an ordinary music cartridge. Every month or so clean the parts of the player with a tape recorder liquid cleaner.

Emergency equipment. Some of the items you should keep in the car for emergencies are a first-aid kit, fire extinguisher, fuses (at least two of each capacity the car uses), flashlight, flares and reflective devices, and a blanket. In addition to a jack and lug wrench, you should also keep an adequate toolkit. It's also a good idea to carry some basic spare parts like points, condenser, coil and plugs, in your car.

Keep a log. Always make a note of the work you do on your car and the parts you

date	mile	gas	oil	other
1/16/77	15.4	5.00		
1/17	10.7	4.50		
1/18	10.7	4.50		
1/19	35.4	4.50		
1/20	44.0	7.50		
1/21	61.1	3.75		
1/22	61.1	4.50		
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9/7	61.1	4.50		
9/8	61.1	4.50		
9/9	61.1	4.50		
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9/13	61.1	4.50		
9/14	61.1	4.50		
9/15	61.1	4.50		
9/16	61.1	4.50		
9/17	61.1	4.50		
9/18	61.1	4.50		
9/19	61.1	4.50		
9/20	61.1	4.50		

CREAM CAR WAXES

Why are they so popular?

The new cream car waxes have become very popular in the past few years. Why? Because cream waxes, or "soft pastes" as they are sometimes called, give your car finish the kind of deep, long-lasting shine you get with a hard paste wax... but the creams are much faster and easier to use.

One Cream Wax Stands Out—"Rally".

"Rally", the original "1/2-hour car wax", now in a new, improved formula,

gives a long-lasting shine and protection against dirt, weather and detergents. Available in three popular sizes.



AUTOMOTIVE PRODUCTS

WORTH WRITING FOR

154. EVERYTHING TO FIX YOUR CAR

Full-color catalog describes complete line of Duro-Plastic products that can repair anything from vinyl roofs to engine parts. From Woodhill Chemical Co. Free.

155. 1973 LAFAYETTE CATALOG

Gigantic, colorful catalog has 468 pages of everything from "soup to nuts" in electronics. From Lafayette Radio Electronics. Free.

156. KNOW YOUR CARBURETOR

Are you interested in knowing how your carburetor works, what causes carburetor troubles, how those troubles are corrected? Answers are contained in this 46-page illustrated booklet. From Penreco Inc. 10¢.

157. BOOGIE IN YOUR BUGGY Beautiful, full-color catalog and product information folder gives complete details of full-range of car tape decks and radios (some in stereo) offered by Panasonic. It's music to your ears. Free.

158. REVITALIZE YOUR CAR!

Informative brochure covers all details on the CompuSpark ignition system that gives renewed performance to your car and virtually eliminates the need for tune-ups. From Gaylord Electronics Inc. Free.

159. WHAT'S THE BEST TIRE FOR YOU?

Find out with this all-inclusive catalog. Gives full specifications on all tires offered by the Seiberling Tire & Rubber Co. Free.

160. THE ESSENTIAL FLUID

Factual, to-the-point booklet gives complete information on what you should know about the oil you put into your car. From Quaker State. Free.

161. ACCESSORIES GALORE

All new 1973 Superior Industries catalog has everything a car buff could want for his machine—from license plate frames to mag wheel covers. Free.

162. THE RITE PRODUCT FOR THE RIGHT JOBS

Beautiful, full-color catalog has complete listing of electronics car products offered from Rite Autotronics Corp. Includes gauges, dials, panel switches,

timing lights, etc. Free.

163. KNOW HOW TO COOL AND FEED YOUR ENGINE

Two booklets give the straight talk on how you can avoid problems with your engine before they start. Both from E. I. DuPont and they are Free.

164. TOOLS FOR THE MECHANIC

A new, revised hand tool catalog has been published by Channellock, Inc. In addition to the popular tongue and groove pliers, the catalog includes a complete line of precision pliers, screwdrivers, wrenches, hammers, etc. Free.

165. "WHAT EVERY DRIVER SHOULD KNOW"

This illustrated booklet is crammed with 85 expert ideas and tips to make your driving safer and more fun. From General Electric Miniature Lamp Dept. Free.

166. REPAIR YOUR CAR'S BODY THE EASY WAY

This illustrated, "how-to-do-it" brochure gives you all the tips you need to get professional results. From Bond-Tite Div. of the Oatey Co. Free.

one always stands out



1918 four-cylinder Stutz "Bearcat"
Frederick C. Crawford Auto-Aviation
Museum

MOTOR OIL REFINED FROM
100% PURE PENNSYLVANIA
GRADE CRUDE OIL —
THE CLASSIC OIL FOR MORE
THAN 64 YEARS

How do you preserve a car so that it becomes a true classic, like this 1918 Stutz "Bearcat"?

One engine preservative stands out: Regular use of a brand of Pennsylvania Grade motor oil, refined from the world's finest crude.

No other crude oil in the world compares with that from the Pennsylvania region for natural lubricating qualities—for natural oiliness, highest viscosity index, all-around engine protection.

Motor oils from Pennsylvania Grade crude always stand out. The most asked-for brands of motor oils coast to coast, season after season.

Free booklet gives helpful car care information. Write Dept. PM.

"Pride of
Performance."

PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION

P.O. Box 250, Oil City, Pennsylvania 16301

167. LUBE TIPS

and techniques from Rislone. Answers to some of the most asked questions about viscosity, additives, sludge and multi-graded oils. Free.

168. SOLIDOX: EASY NEW WAY TO WELD

Send for information about this revolutionary welder. It's safe, portable, strong, economical and easy. Ideal for car or cycle repairs. Cleanweld Products. Free.

169. U-DO-IT PARTS CATALOG FOR VW, DATSUN, & TOYOTA OWNERS

Comprehensive 72-page catalog has photos and descriptions of literally hundreds of "U-Do-It" replacement parts and accessories. From Pro-Am Automotive Products, Inc. \$2.00.

170. SPRAY AWAY SCARS ON CARS

Aerosol spray refinishing auto surfaces is made easy with this instructional booklet. Trade secrets for touching-up nicks, scratches and scars are revealed in layman's language. From Dupli-Color Products. Free.

171. DO-IT-YOURSELF GUIDES

Catalog of Audel guides for carpentry, plumbing, upholstering, auto repair, machinist's techniques, and many other subjects. Free.

172. GET YOURSELF A TURTLE!

Turtle Wax, the Car Care Expert,

presents "Tips from the Turtle", a full-color booklet on how to care for your car, inside & out. Included are valuable tips on waxing, washing, vinyl top and upholstery care. Booklet plus decal are Free.

173. ALL NEW EDELBROCK CATALOG FOR 1973 . . . YOUR GUIDE TO MANIFOLDING

From the handy technical tips and interesting racer articles to the beautifully-prepared manifold presentation, the '73 Edelbrock Catalog is a delight to read (includes decals). Free.

174. PRODUCTS FOR PROS LIKE YOU

Informative literature gives full details of Go-Jo Industries' product line. Included are: auto body repair kits, fiberglass kits and hand cleaners. Free.

175. GET ON THE FAN WAGON!

Send for full catalog and brochures and learn how your car can run like the wind. From Flex-a-lite Fans. Free.

176. WHAT'S YOUR VOLTS?

Brochure describes the Volticator, a 12-volt Mini-Diagnostic Meter that plugs into your car's cigarette lighter and tests battery, alternator, and charging system performance. From J. F. Ivan Co. Free.

177. 1973 CHILTON'S AUTO REPAIR MANUAL

Nearly 1,500 pages of accurate,

comprehensive information that can help you tackle any repair or service job. Free brochure gives full details. From Chilton Books.

178. CHEMICAL TOOLS

Colorful catalog gives full range of car care products offered by Radiator Specialty Co., the choice of the professionals. Products include rust removers, parts cleaners, sealants, etc. Free.

179. NOT A STONE IS LEFT UNTURNED

in this concise, precise, authoritative guide to motor oil selection. Topics range from viscosity to oil drain practices. From the Pennsylvania Grade Crude Oil Association. Free.

180. PUT THE BRAKES ON YOUR BRAKE PROBLEMS

If the brakes in your car aren't in top condition, you're asking for trouble. Grey Rock Division of R-M offers a pamphlet showing highlights of things that can go wrong with brakes. Free.

181. TWO LOVE DECALS & COLORFUL HIGH PERFORMANCE CATALOG

Send for window love decal and catalog—25¢, or large fender love decal and catalog—50¢. High performance catalog has product description and passenger car applications for mechanics and "do-it-yourselfer" car buffs. From Wells Mfg. Corp.

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| <input type="checkbox"/> 156 (10¢) | <input type="checkbox"/> 161 | <input type="checkbox"/> 166 | <input type="checkbox"/> 172 | <input type="checkbox"/> 178 |
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NOTE: POPULAR MECHANICS processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Please allow 4-6 weeks for delivery.

A Message from Victor Gelb, President of APAA



Buyers of automotive products will soon be finding the Automotive Parts & Accessories Association's (APAA) "Symbol of Consumer Protection" on more and more packages of their purchases at automotive retail outlets.

What is the APAA? What does the symbol mean to motorists and to do-it-yourselfers? Automotive Parts & Accessories Association was formed several years ago by manufacturers, retailers, distributors and others involved in getting automotive products for motorists.

The idea was to present a unified effort by the various segments of the industry to obtain "freedom of choice" in such areas as the purchase of seat belts, pollution control devices, and automotive service.

Obviously, the consumer should be entitled to buy seat belts, head rests and other products when he buys a car. But on the other hand, he also should be entitled to buy products equal to or exceeding Federal standards elsewhere, and to perform his own installation.

The do-it-yourself market is one of the most dynamic segments of the automotive industry. The do-it-yourselfer cares about his car. He knows that a thorough repair job safeguards his life and the lives of his family.

The do-it-yourselfer's car is less likely to be a polluter. He can tune his car more often because he *wants* to keep it running right, and he is paying only for the parts.

Then there is the non-do-it-yourselfer whose favorite mechanic may not be employed by a new car dealer. APAA contends that the car owner should be able to select his auto service shop without fear of jeopardizing his car's warranty.

In seeking freedom of choice for the motorist, the Association's consumer protection

program evolved into a formal Consumer Protection Council and code early in 1970. This Council has 15 members from all distribution categories in the so-called volume aftermarket, including many of the major retailers of automotive products.

This landmark program received recognition from Mrs. Virginia Knauer, President Nixon's Special Assistant for Consumer Affairs.

The function of the APAA Council is to review any complaints or problems submitted by participating members or consumers, with the hope of helping the two parties arrive at an equitable solution.

The code is pointedly clear; APAA members are encouraged to:

- (A) Produce and sell goods of the highest quality and best value.
- (B) Produce and sell goods as safe as possible, attempting to eliminate any harmful side effects.
- (C) Establish warranties and guarantees that are clear, simple and honored.
- (D) Educate sales people and the public as to capabilities and limitations of the products member companies sell.

Each participating retailer member displays the APAA Consumer Protection symbol prominently in his store. This lets his consumers know that they are doing business with a participant who is pledged to deal fairly with the public.

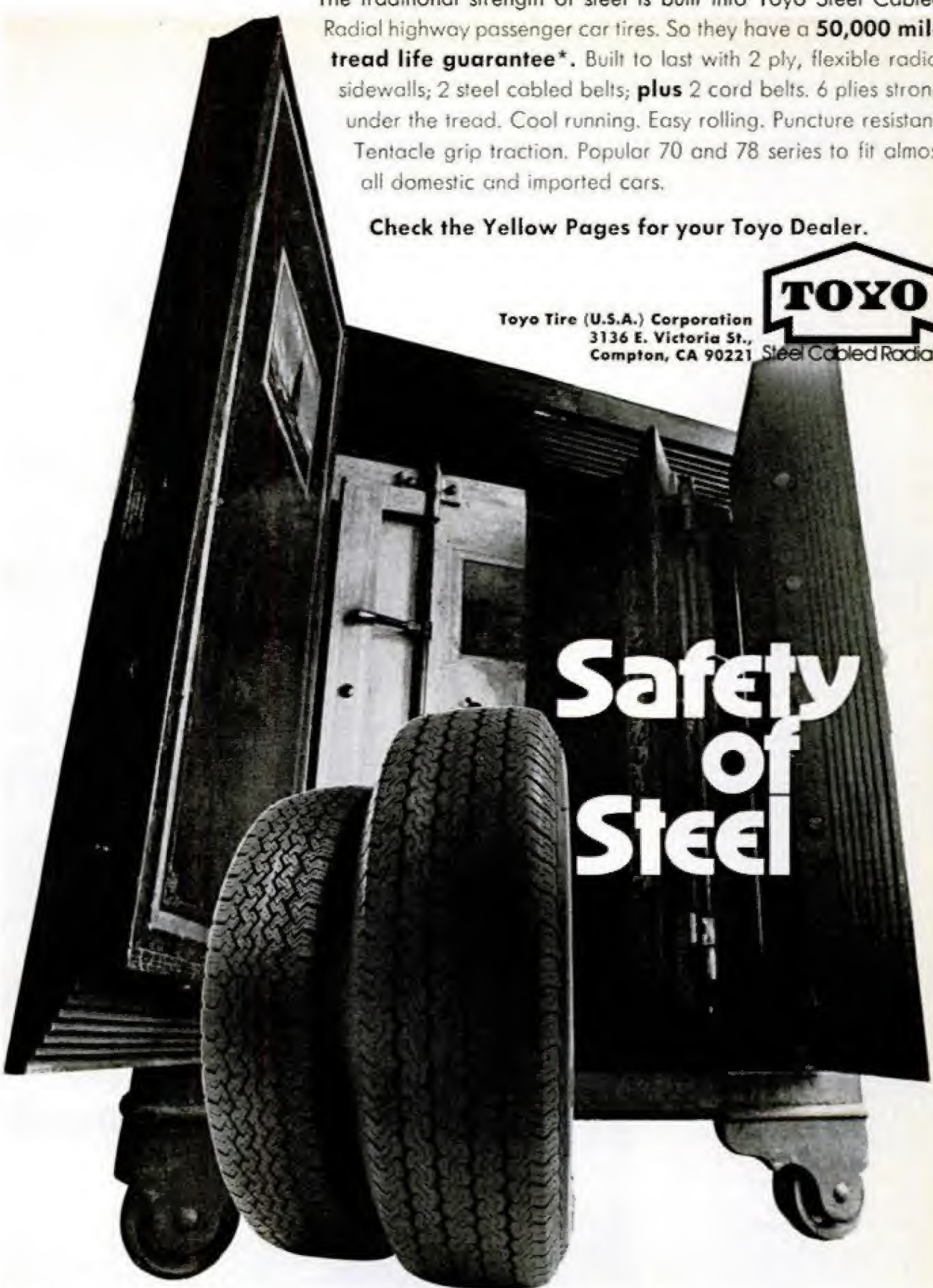
The symbol indicates to the customer that the retailer's goal is the customer's complete satisfaction. If a problem related to either product or service arises which the retailer and the customer are not able to solve, it can be submitted to an impartial council for review and resolution.

Motorists need freedom of choice. They should be able to buy the best possible product at the lowest possible price, and buy it wherever and from whomever they wish.

That's what APAA and its Symbol of Consumer Protection are all about.

APAA's membership is open to all automotive aftermarket manufacturers, retailers and distributors who would like to join APAA in making this choice always possible.

Presented by Popular Mechanics for Reader Information



The traditional strength of steel is built into Toyo Steel Cabled Radial highway passenger car tires. So they have a **50,000 mile tread life guarantee***. Built to last with 2 ply, flexible radial sidewalls; 2 steel cabled belts; **plus** 2 cord belts. 6 plies strong under the tread. Cool running. Easy rolling. Puncture resistant. Tentacle grip traction. Popular 70 and 78 series to fit almost all domestic and imported cars.

Check the Yellow Pages for your Toyo Dealer.

Toyo Tire (U.S.A.) Corporation
3136 E. Victoria St.,
Compton, CA 90221



Safety of Steel

*Every Toyo Steel Cabled Radial highway passenger car tire is guaranteed to have an original tread life of 50,000 miles with normal passenger car use. Should the tread wear out before 50,000 miles, the owner should submit his guarantee certificate and worn out tire to any Toyo dealer in the continental United States. The Toyo dealer will give credit toward a new tire, or cash refund, at his option, for an amount determined by multiplying the adjusting dealer's actual current retail price at the time of adjustment, by the percentage of mileage not run.

You get a lot more out of Chilton's Auto Repair 1973...

STARTING SYSTEM DIAGNOSIS

Problem	1. No power to starter	2. Starter solenoid clicks	3. Starter motor hums	4. Starter motor does not turn
Causes				
Battery Not Fully Charged	•			
Loose Battery Cables	•			
Defective Battery	•			
Shorted or Loose Starter Wire	•	•	•	•
Defective Solenoid	•	•	•	•
Engine Overheated	•	•	•	•
Low Temperature	•	•	•	•
Thick Oil	•	•	•	•
Defective Ignition Switch	•	•	•	•
Defective Starter Switch	•	•	•	•
Open Circuit in Starter Wires or Fuel Cuts	•	•	•	•
Short in Field or Armature Coils	•	•	•	•
Reversed Starter Switch Wires	•	•	•	•
Problems with Motor	•	•	•	•
Defective Ignition Switch	•	•	•	•
Defective Starter Switch	•	•	•	•

Not just another how-to book, CARM '73 gives you all this . . . and much more.

In-depth coverage on new developments.

■ A separate section on troubleshooting all types of emission controls, to help you live within the standards. You test each system first, then isolate components one by one until trouble-spots are located. Tune-up procedures are explained in detail.

■ Special feature! A nontechnical discussion of the Wankel engine, describing its operating principles and comparing it with the present piston-type engines. Includes diagrams.

Special advantages.

■ Nearly 1500 pages, over 4000 illustrations . . . photos, exploded views; tables, charts . . . for all popular American cars, 1966-1973—including Jeep, and the new Olds Omega.

■ Information so comprehensive it helps you determine whether you should tackle the job, or have a garage do it . . . and helps you understand what the garage will have to do to correct the problem.

New feature! Complete section of Diagnostic Charts to help you check out each primary system and find where the problem is by a step-by-step process of elimination.

■ Both factory and "time-saver" procedures are given for certain jobs, so you have a choice.

■ Detailed instructions on components and subsystems, in a separate section.

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■ Everything indexed. Color-coding throughout. Large, easy-to-read type.

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We have a full-time staff of editors working on CARM the year round. Each one is not only thoroughly trained, widely experienced in all areas, he's also a specialist in one or more specific areas of automotive repair.

Our editors write CARM in its entirety, to make sure what you read is thoroughly proven, highly accurate. They apply common sense, and write in "people language." Basic information is selected carefully, expanded, and then interpreted . . . to make CARM '73 as useful as possible . . . to give you what you really need to know.

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Please send me CHILTON'S AUTO REPAIR MANUAL 1973, for which I enclose check/money order for \$10.95, plus any applicable tax. If not satisfied with this book, I may return it postpaid, in clean, saleable condition, within 10 days for full refund.



Name _____

Address _____

City _____

State _____ Zip _____

May is Car Care Month Headquarters

The following is a partial list of retailers who are your "Car Care Month Headquarters". Look for special displays and their advertisements in your area.

Rupp Automotive
Holiday Tire & Auto
Centers
Prange-Way Auto Centers
Skaggs
Forest City*
Uniroyal Home & Auto
Centers
Fisk Home & Auto Centers
Pan American Tire Co.
Globe Discount City*
K-Mart*
Murphy's Mart*
Gimbels*
Klein's*
Arlan's Auto Service
Centers*

Harts*
Schottenstein's*
R & S Auto Stores
Parkview-GEM*
Lloyd's*
Falks
Major's
Merit's
Belscot*
Big M
Valley Fair*
Q-Mart
Crown Auto Stores
Aid Stores
Barkers*
Grand Auto Stores

Monte Marts
Auto-Fix International Ltd.
Boyer Automotive Supply,
Inc.
Champion Auto Stores
Honey's Auto Parts
Jack & Harry's
Valu-Mart Tire & Auto
Centers
Top Auto Supply Stores
Bosco's Department
Stores
H. F. Automotive Supply
Advance Auto Stores
Big N Department Stores
Blue Star Auto Stores

Kragen Auto of California
Kragen Auto of Texas
True Value Hardware
Stores*
Leonards Tire & Auto
Center
Motor Inn Auto Supply
Thrifty Auto Parts
The Pep Boys—
Manny, Moe, & Jack*
Roddy Discount Auto
Stores
OTASCO Stores*
Schuck's Auto Supply
Guarantee Auto Stores
Checker Auto Parts Stores
Nationwide Auto Parts
*not all stores

The Electronic Ignition that turns on Tom McCahill.

When Tom McCahill tested Gaylord's CompuSpark™ Capacitive Discharge Ignition, he said it flat out; "For my money, CompuSpark's a steal. Under 50 bucks: No moving parts. Fully electronic. Solid-state. And CD, too! "It's built like a brick out-house. They tried to wear one out and stopped at 270,000 miles when the car fell apart.

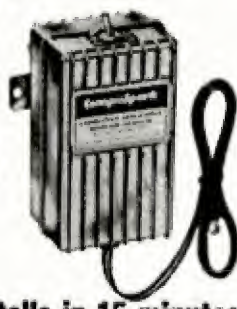
"What's in it for you? It virtually does away with point wear. Ends plug fouling hassles and puts plug wear way down the road. Often cuts your gas consumption by 20% and makes your engine run clean.

"The reasons for all this are as obvious as warts on a snake. A 60,000 volt spark is a helluva lot hotter than a stock ignition. CompuSpark — 'The Ignition System with a Brain'™ actually computes spark characteristics to engine RPM. You get the right spark at the right time and the right place. Darned things run great in Alaska or the tropics. Why not? All silicon, y' know. And the anti-theft lock really works!

"Another thing: CompuSpark is guaranteed one month longer than a Rolls-Royce: 37 months free repair or replacement. 30 day money back guarantee, too!

"Think of it this way: One skipped tune-up and CompuSpark has paid for itself. Two and you're money ahead. Plenty more where that came from — you're in clover, right? You bet.

"Order your CompuSpark now. It turned me on. I'm sure it'll turn you on, too!"



Installs in 15 minutes.



Rush me: ☐ CompuSpark ready to install. \$49.95
☐ Kit \$39.95
☐ CompuSpark brochure, free.

Car Year & Make _____

Name _____

Address _____

City, State, Zip _____

Enclosed: \$_____ Ship ppd _____ Ship C.O.D. _____

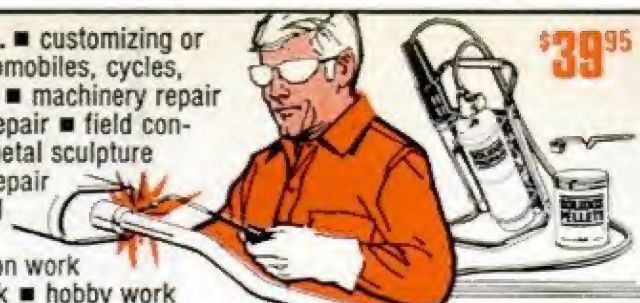
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☐ Master Charge ☐ BankAmericard ☐ American Express
For Credit Card orders supply all card information.
California residents, please include sales tax.

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Gaylord Electronics Inc. Dept. 20MY.
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BRAZES • WELDS
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IDEAL FOR... ■ customizing or repairing automobiles, cycles, go-carts, etc. ■ machinery repair ■ plumbing repair ■ field construction ■ metal sculpture ■ farm tool repair ■ garden tool repair ■ wrought iron work ■ rescue work ■ hobby work



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KIT INCLUDES: Torch, propane, pellets, braze rods, glasses, lighter, guarantee, etc. Only \$39.95 (California residents add 5% sales tax.)

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TEST BATTERY, ALTERNATOR & CHARGING SYSTEM PERFORMANCE

Never Again Get Stuck With a Dead Battery!



Plugs into
Cigarette
Lighter

Ever got in your car, turned on the starter, and uhhnn—nothing happens—your battery is dead?...Ever replaced battery, alternator, regulator and still had battery problems? Ever been "sold" a battery you really didn't need?

VOLT-I-CATOR tells you instantly the state of battery charge. Shows alternator output, rate of charging. Warns of dead cell, corroded cables, undercharging, overcharging, slipping fan belt. Rugged. No technical knowledge necessary. One year guarantee. 30-day moneyback guarantee. Warns you to get repairs BEFORE a breakdown occurs. As valuable as your gasoline gauge.

VOLT-I-CATOR fits any 12-volt car, truck, boat or camper.

Send for free VOLT-I-CATOR data. Or order now \$13.50 postpaid. Special: 3 for \$9.89 each ppd. Ohioans add tax. Dealers invited. Free catalog of gauges & meters with each order.

J. F. Ivan Co., 10918M Governor Ave., Cleveland, Ohio 44111

FIRST AID



Trans Cure aids all transmissions.

Its exclusive plating action stops leaks, prevents seals from hardening, drying and shrinking.

That's just for starters.

Trans cure gives smooth performance between gear changes, too. And reduces howl and grind.

Trans Cure. Just one of Kapro's 18 cure additives to help your car, cycle and boat run better.



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A great idea that will multiply the value of your back issues of PM. The index is bound into a handsome wrapper made of heavy board and encloses the 12 issues which are cross-referenced in the Index. Makes a beautiful and useful addition to your bookshelves. Price only \$1.49. Send orders to Popular Mechanics (Dept. I) Box 1410 Radio City, New York, N.Y. 10019.



How to keep your beautiful vinyl top from being ravaged.

Each day, rain, sun, snow, salt, detergents, dirt, pigeon droppings, grease and the like plunder your vinyl top's original beauty. Premature vinyl top aging is one of the first signs of automobile deterioration, resulting in brittleness and discoloration. Darker colors pale. Lighter colors muddy.

Don't blow your top. What can you do about it? If you own a new car, wax your vinyl top immediately. Just as you give your car an undercoat, give it an overcoat. And if your vinyl top has already shown signs of aging, you can still restore it. Here's how.

Cutting the crud. First, your vinyl top must be cleaned. Do *not* use harsh household cleaners, detergents, soaps or bleaching agents. They do more damaging than cleaning. Turtle Wax Vinyl Top Cleaner in the easy-to-use aerosol can is gentle on your vinyl and tough on grime. The foam formula applied with a soft brush (not a wire one) flushes out grit.

Put the black back. Now, the right overcoat. For black vinyl tops, Turtle Wax Black Top Wax revives the deep-black lustre your top had when it was new. That soft, supple, leather-like feel reclaims itself. Brittleness disappears. And an invisible silicone barrier seals out soil, dust, and grease.

Transparents and guardians. For white or colored tops, there's Turtle Wax Neutral Vinyl Top Wax. Instead of adding color, it imprisons the color behind its transparent shield. Both Neutral and Black come with no-mess sponge applicator. For people who prefer a liquid, there's Turtle Wax Vinyl Top Clear Liquid Wax. It's self-polishing—lasts for months without cracking, peeling or discoloring.

Why Turtle Wax? Of course, we recommend our brand. Because car care products are all we make at Turtle Wax. So we figure we damn well have to make them better than anybody else around.



Vinyl Top Products by Turtle Wax.



At 180 MPH they need all the brakes they can get.

And they get all the brakes they need from GREY-ROCK

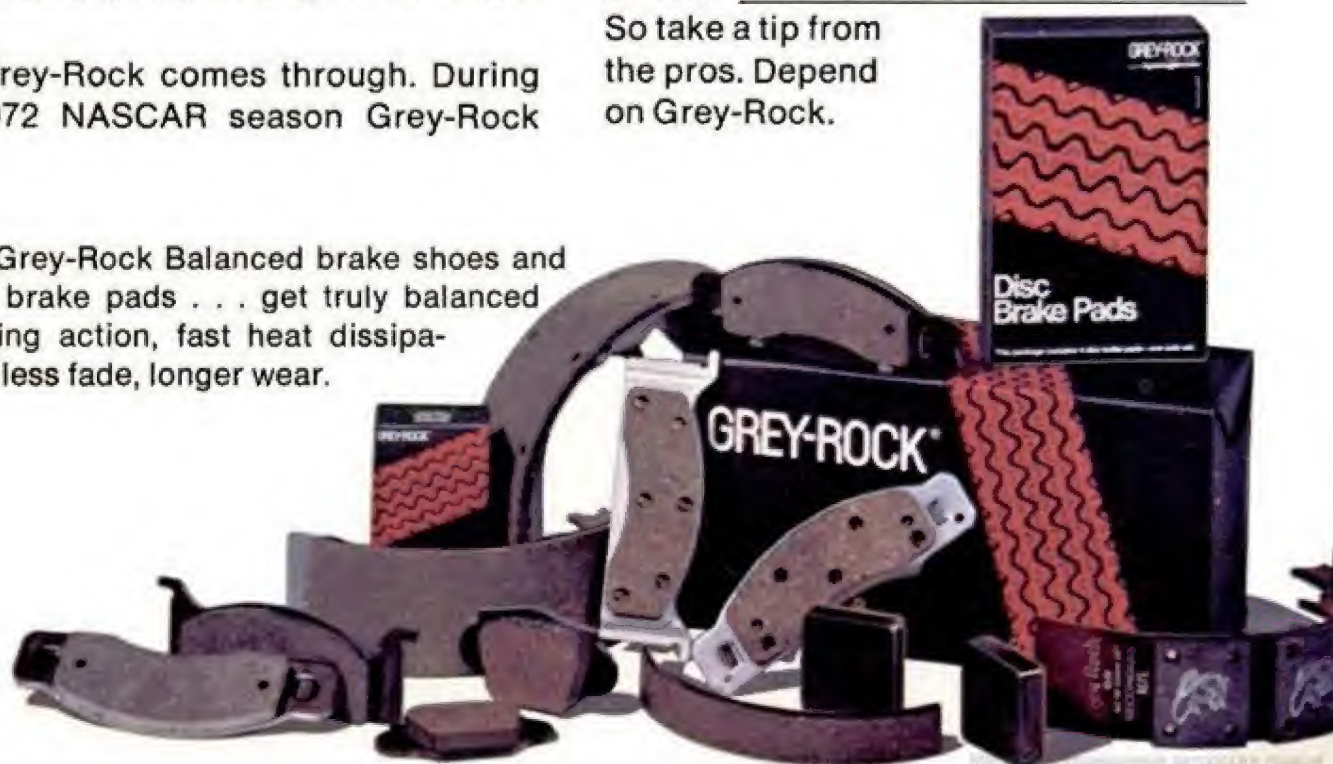
Almost to a man, the drivers on the NASCAR Grand National stock car racing circuit depend on Grey-Rock® brake lining.

And Grey-Rock comes through. During the 1972 NASCAR season Grey-Rock

equipped cars raced 350,000 brake-torturing miles and made over 6,000 fast pit stops with not one brake lining failure!

So take a tip from the pros. Depend on Grey-Rock.

Get Grey-Rock Balanced brake shoes and disc brake pads . . . get truly balanced braking action, fast heat dissipation, less fade, longer wear.



Make your own center- shot bow reel

Rough-fishing with a reel you carved yourself can add extra pleasure to a special kind of archery afloat

By BOB HICKORY



WHETHER YOU HUNT carp in Illinois or sharks on the Florida flats, the center-shot bow reel makes your shooting more precise. You can add to the fun if you make your own reel.

The wooden reel is laminated from select, split-free, straight-grained hardwood—such as fruitwood, walnut, maple or birch—and turned on a lathe. The glued-up block should be approximately 3 in. thick and $6\frac{1}{4} \times 6\frac{1}{4}$ in. square. Since the reel will be exposed to weather, use waterproof glue to do the laminating. Next, glue a $\frac{3}{4}$ -in. pine block to the back of the laminated block with paper between the pieces.

Mark intersecting lines from corner to corner to find the exact center. Place

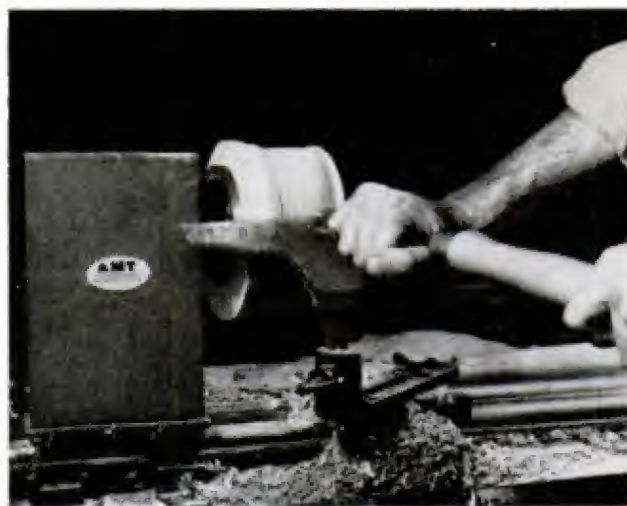
a compass o.c. and draw a $6\frac{1}{4}$ -in.-dia. circle. Cut the waste using a coping saw or bandsaw.

To cut down vibration from the hefty block, position the mounted block as near center as possible on the faceplate. Fasten the pine block to the faceplate using screws that *will not* go through into the turning block. In this way you will avoid the risk of screws protruding into the turning block which might catch your chisels and cause damage. When you finish turning, you can separate the pine block from the turning by inserting a chisel at the paper and tapping.

With the workpiece mounted in the lathe, use a slow speed and turn the work using a round-nose chisel. Care-



1. **LAMINATED HARDWOOD BLOCK** is glued to a pine backup block with a paper separator spaced between



2. **LATHE TURNING** shaves down outside of reel, and fine sanding later prevents snagging of arrow line



4. **CHISEL TAP** separates pine backing block from reel. Block prevented screws from touching hardwood



5. **BENDING** aluminum bracket strip in vise gives it shape (shown opposite on diagram) before mounting

fully rough-out and "true" the piece to round. With the outside turned to the shape desired, remove the toolrest and thoroughly sand the piece smooth using a fine sandpaper (No. 120 grade or finer).

Replace the toolrest and position it flat across the front of the workpiece. Start the lathe and work the round-nose chisel in on the left side (as you face the revolving workpiece). Since friction—inside the small diameter—causes workpiece and tool to get hot, stop occasionally to let both cool. Cut the inside profile as shown in the drawing. When you cut through the paper lamination and can see the pine block, the turning is finished. Remove the toolrest and again sand smooth.

Because the bow rig will be exposed to all kinds of weather and treatment, make certain you use a weatherproof finish. On the model shown, while it was still in the lathe, I applied a paste-wax finish,



PLASTIC ELECTRICAL TAPE secures reel brackets to bow. Tape should be removed after use, or left on no more than a week, to prevent possibility of sticky black adhesive from tape remaining on bow



3. **INNER CUT** to hollow out reel is stopped once backup paper and pine block with screws are reached

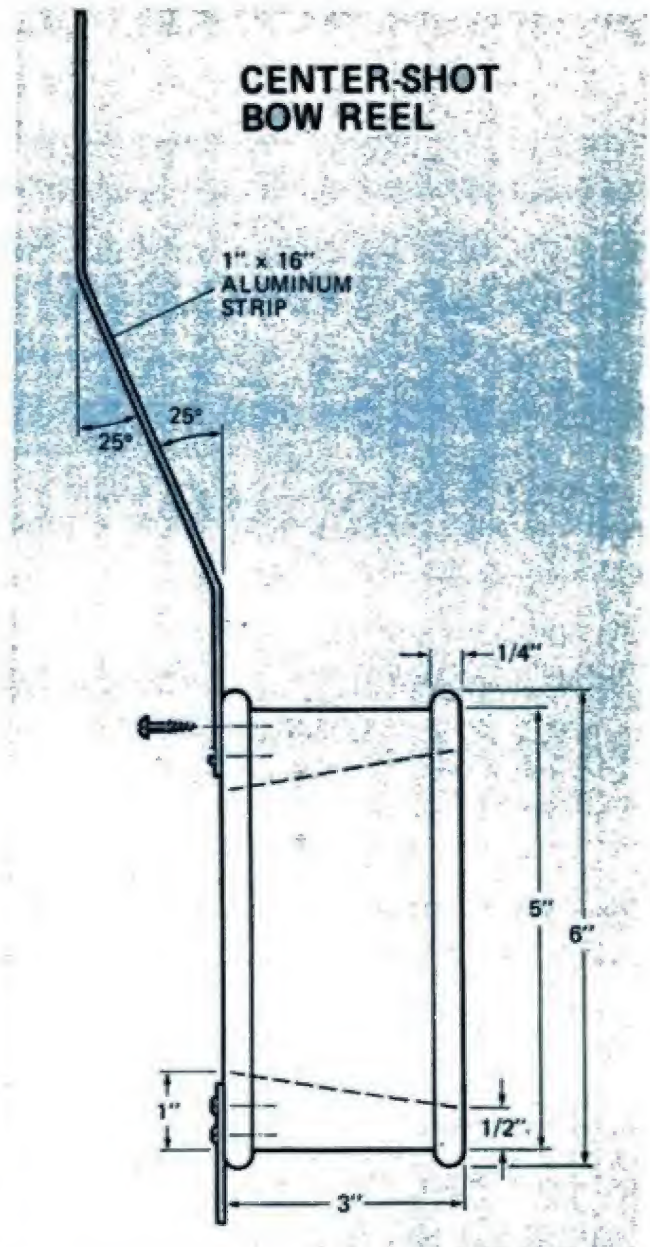


6. **ALUMINUM STRIPS**, with 25° bends shown at right, are now secured to center-shot reel with r.h. screws



PROOF of performance is demonstrated by author. He finished off reel on lathe with fine sandpaper, paste wax, and high-speed burnishing with fine steel wool and a soft cloth to weatherproof the hardwood

MAY 1973



burnishing it at a fairly high rate of speed with fine-grade steel wool and a soft cloth.

The metal supports are cut from 1-in. do-it-yourself aluminum available at hardware stores. Cut them to length and use emery cloth to smooth the ends. (Rough edges might cut the bow or your arrow string.) Holding the supports in a vise, bend the ends to the angles shown in the drawing above. Then, drill the two holes in the ends, remove the supports from the vise and fasten them in place with roundhead screws.

To attach the bow reel to your bow, tape it in place with plastic electrical tape. Do not leave it on for any more than a week's time, as the tape may leave a sticky, black residue. Wind about 200 ft. of nylon line (at least 40 pounds test) on the reel, tie the end to a fishing arrow and happy hunting.

★★★

How to care for driveshafts and universal joints

By **ROBERT L. TAYLOR**

Technical art by Peter Trojan

DEFFECTIVE UNIVERSAL JOINTS can be killers. Consider a front U-joint coming apart during high-speed interstate travel. The front end of the propeller shaft falls to the ground, acts as a fork and catapults the vehicle. It's a nasty possibility.

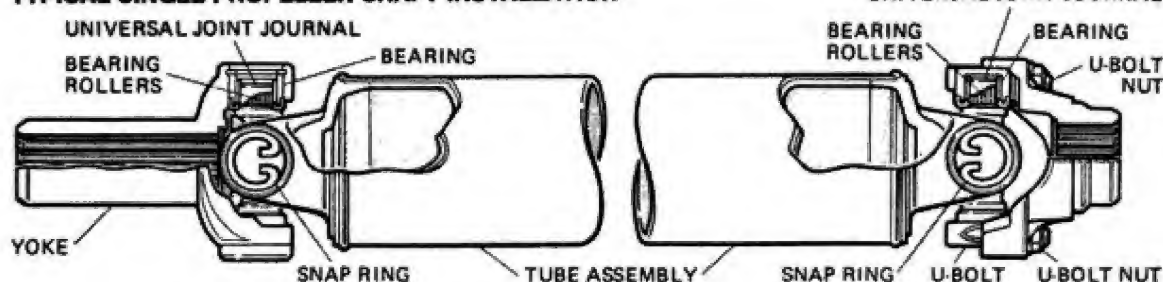
Periodic inspection, proper lubrication and service will go a long way in preventing this kind of drive-line failure. For example, a badly worn U-joint can easily be spotted during a lube job. Wait until your car or light truck is safely raised in the air. Grasp the drive line with both hands,

first near the front U-joint and then near the rear joint. Good universal joints should show no great movement.

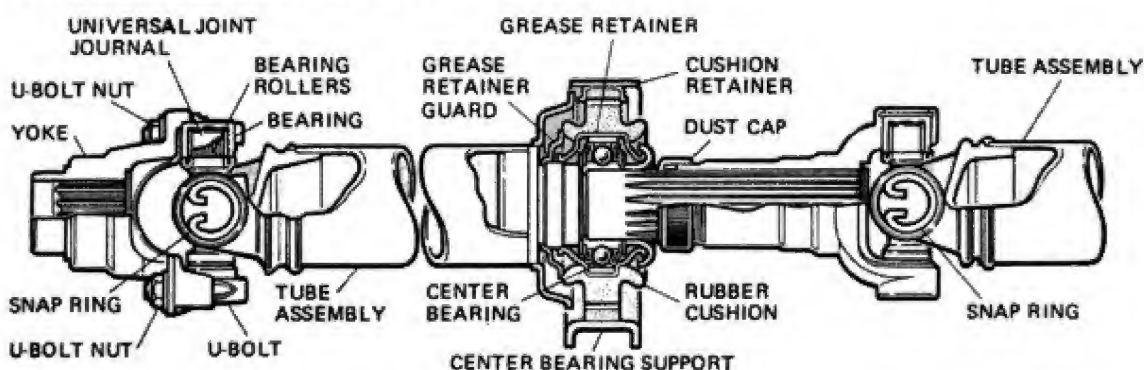
Conversely, good U-joint condition is a prerequisite of smooth, efficient, overall vehicle operation. In effect, not only can vibrations due to defective U-joints cause transmission and differential seals to be ruined, they can also cause bearing failures in these components.

Drive-line functions. Basically, propeller shafts have three functions. First, they must transmit torque (power) from the transmission to the axle. This is accom-

TYPICAL SINGLE PROPELLER SHAFT INSTALLATION



TYPICAL DOUBLE PROPELLER SHAFT INSTALLATION



plished through one or more propeller shafts and universal joint assemblies.

When torque is transmitted through any ordinary universal joint, the driven yoke fluctuates slightly in speed. Although the driving yoke rotates at a constant speed, the driven yoke speeds up and down twice per revolution.

Thus, propeller-shaft and universal-joint assemblies will vary in number depending on vehicle wheelbase and combination of transmission and rear axle equipment.

The second requirement is that the propeller shaft operate through constantly relative angles between transmission propeller shaft and axle. For example, when two universal joints are used, the angles through which they operate must be very nearly the same.

This allows the alternate acceleration and deceleration of the second joint. When the two joints do not run at the same angle, operation is rough and an objectionable vibration is produced.

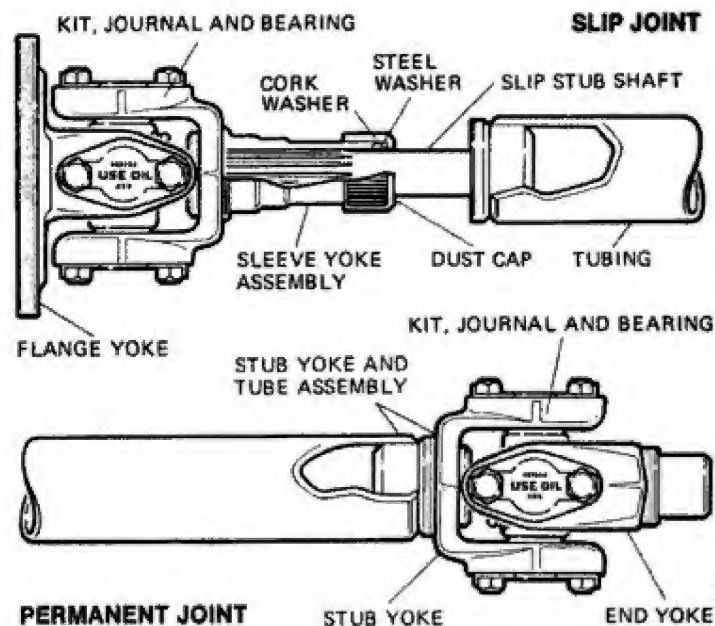
In addition, universal joints are designed to operate safely and effectively within certain angles. If the design angle is exceeded, the joint may be broken or otherwise damaged.

Finally, the length of the propeller shaft must be capable of changing while transmitting torque. Length changes are caused by necessary axle movement due to torque reaction, road deflections, braking loads, and the like. Basically, the slip joint permits slight lengthening and shortening of the propeller shaft to compensate for up-and-down movement of the rear axle assembly.

Propeller shaft types and components. For all practical purposes, propeller shafts are classified into three types of units. Each of these units is composed of similar parts, such as yokes, journal and bearings and tubular shafts. One, two, or all three may be used in a single drive line—some even three or four times, and it is important to establish the specific use of each unit.

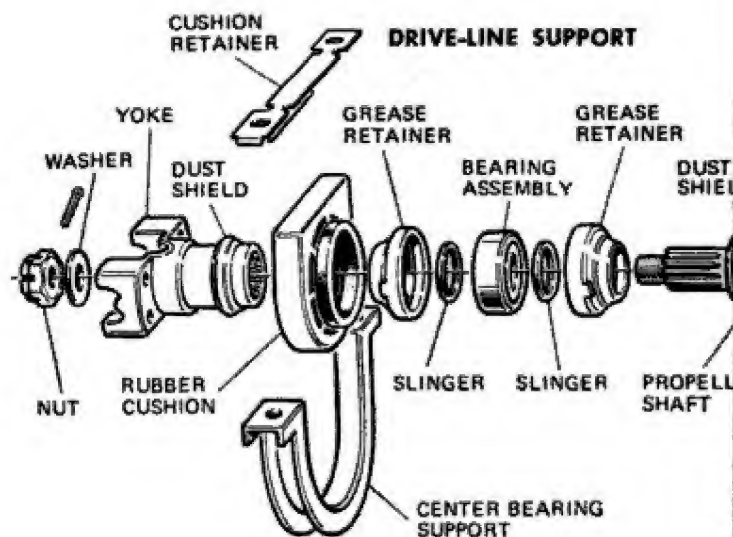
These units and/or assemblies are usually described as follows:

● **Two-joint assemblies.** They are required in every drive line where there is a fluctuating dimension between the power source (transmission) and the driven member (differential). These assemblies may be used alone as a complete propeller

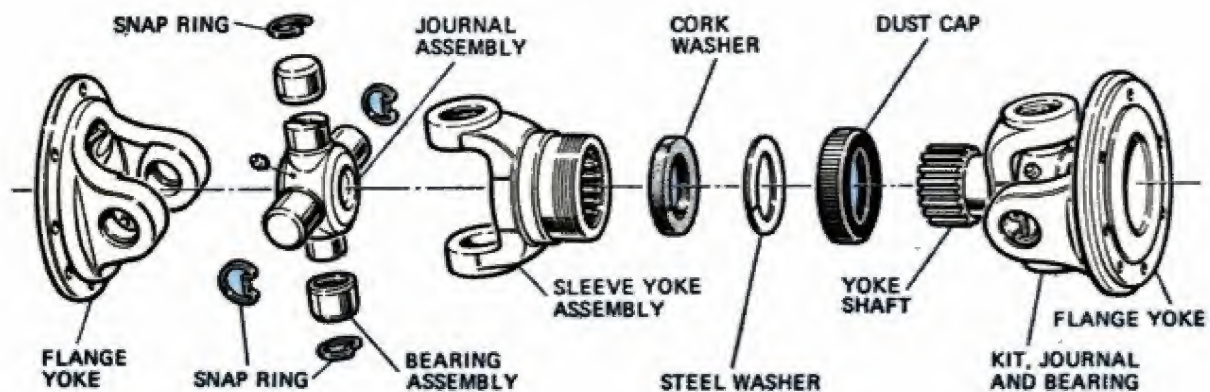


shaft within length limitations, or as a final part of a compound drive line. The front end of the unit contains the *slip joint* which is designed to absorb longitudinal variation. The rear end is fitted with a permanent-type universal joint.

● **Joint and shaft assemblies.** These assemblies are essentially extension members. In automotive applications these units are inserted ahead of the two-joint assemblies and lead out of the power source. The front end of this type unit is a permanent joint, while the rear end is composed of a splined stub shaft with a midship center bearing for suspension. The stub shaft extends through the center



SHORT-COUPLED JOINT



bearing and connects the next unit in the drive line as shown in the "Drive-Line Support" illustration, page 157.

● *Short coupled joints.* These are the third units in the structural makeup. Their use is important when space is restricted, such as between a transmission and auxiliary transmission (in truck applications). Primarily, short coupled joints are similar to two-joint assemblies. You will also find a variety of propeller-shaft yoke constructions to contend with if you have to remove the unit from the car. Some typical alternate yoke constructions are shown in the illustration on page 159.

● *Center drive line bearings.* Center bearings are used to support the center portion of a drive line when two or more propeller shafts are used. Generally speaking, bearings are the ball type, mounted in a rubber cushion that's attached to the frame cross member by the center bearing support. Some center bearings are used at the shaft end with a slip yoke; others are used at the shaft end with fixed yoke. The bearing is prelubricated and permanently sealed. (Some truck applications may be provided with grease zerks.) Cavities in grease retainers on both sides of bearing are packed with waterproof grease to exclude dirt and water.

Propeller-shaft removal. Raise your vehicle with suitable hydraulic jack. *Never use a bumper jack for this job. Never use cement blocks, wooden blocks, etc., as a means to support vehicle while work is*

being done. Use only safety-tested jack stands.

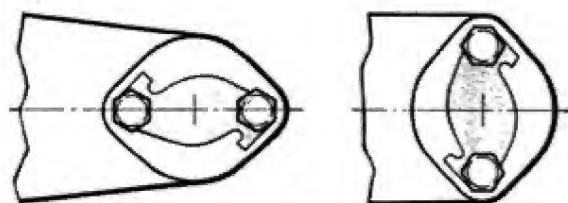
After the vehicle is safely set on jack stands, scribe a mark on shaft and companion flange to insure assembly will be reinstalled in exactly the same relative position. Disconnect the shaft at the rear joint. If equipped with center bearing, disconnect the center support bracket at the cross member. Before removing the propeller shaft, tape bearing cups at rear U-Joint to prevent loss of bearing needles.

Disassembling universal joint. 1. Remove snap ring by pinching the ends together with a pair of snap ring or needle-nose pliers. If a ring does not readily snap out of the groove in the yoke, tap the end of the bearing cup lightly to relieve the pressure against the ring.

2. To remove the needle bearing cup, fasten the propeller shaft in a vise. An old broken socket offers a good tool that can be used as a punch. Removing by driving on the end of one bearing cup until the opposite bearing cup comes out. Turn the joint over and tap the exposed end of the journal cross until the opposite needle bearing is free. However, always use a brass hammer or a soft round drift with a flat face; otherwise there will be danger of damaging the bearing and/or journal cross.

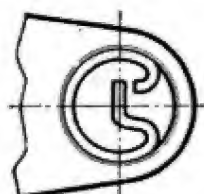
3. Remove the journal cross by sliding it to the side of the yoke and tilting it over the top of the yoke lugs. Reassembly should be the opposite of disassembly procedures.

Cleaning and inspection: 1. Clean all

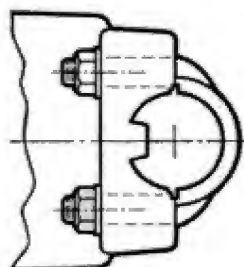


BEARING CAP

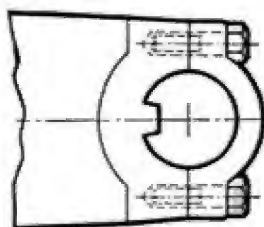
BEARING CAP



SNAP RING



U-BOLT



CAP AND BOLT

ALTERNATE YOKE CONSTRUCTIONS

moving to each side and finally forcing grease down from the top of the journal. Next, fill each bearing face with grease to a depth approximately equal to one-quarter of the roller length. The lubricant quantity must be maintained within close limits to eliminate the possibility of a pressure buildup in the bearing that would rupture or deform the long-life seal when these bearings are being assembled to the journal.

Generally speaking, replacement U-joints will be found fitted with grease (zerk) fittings. Proper lubrication can be made with any conventional grease gun. Care should be exercised so that grease-gun pressure is not allowed to break seals.

In effect, it is necessary to add lubricant until all four bearing caps are purged and lubricant can be seen escaping from all four seals. In some instances, the seals may not relieve lubricant readily. *Do not add more pressure to grease gun.* Force should be applied to the propeller shaft in a direction away from the seal at the same time the lubricant gun is applied to the zerk fitting. If this procedure does not allow proper lubrication, the journal and bearing should be checked and replaced, if necessary. ★★★

parts (*do not use gasoline*) with a suitable, safe cleaner. All the parts must remain in the cleaner for some time to loosen even the most stubborn particles of grease or foreign matter.

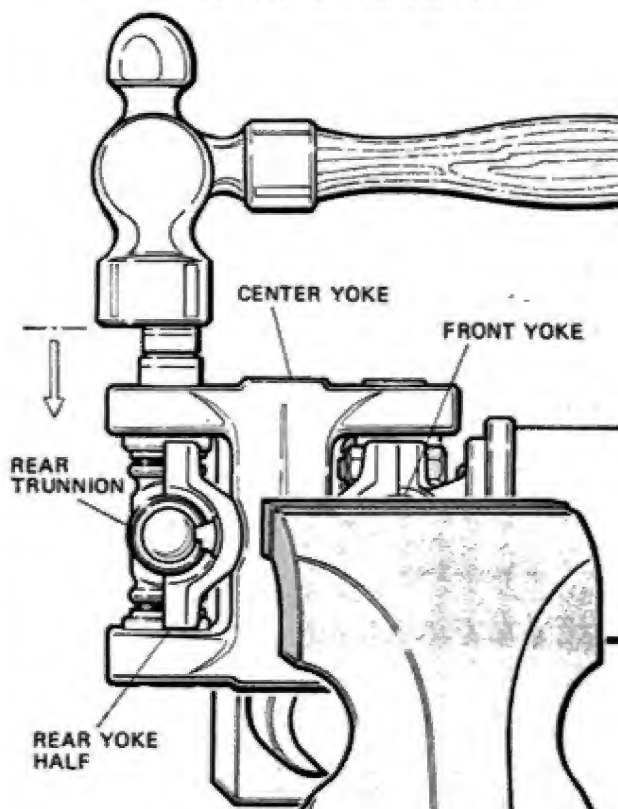
2. *Do not disassemble* the needle bearings. Instead, clean them with a stiff brush and blow them out carefully with air pressure.

3. Because worn needle bearings used with a new journal cross or new needle bearings used with a worn journal cross will wear more rapidly, making another replacement necessary in a short time, always replace the journal cross and four needle-bearing caps as a unit.

On joints without lubrication fittings that are found to be in good condition, repack reservoirs in the journal cross ends with the recommended lubricant listed in car owner's manual.

You can make sure the reservoir in each trunnion is filled and that air pockets are not formed by starting at the bottom and

DISASSEMBLING UNIVERSAL JOINT



Hints from

Pop rivets work as scaffold nails

Needing double-head (scaffold) nails for some temporary bracing but being unable to buy them locally, I discovered that squeeze-type rivets ("Pop rivets" is one brand name) make a fine substitute. If driven and extracted carefully, they can be used more than once, and still be usable for their original purpose.

—Andrew Vena, Philadelphia.

Wrench aids tire inspection

The lack of a tire spreader can be annoying when you want to check the inner sidewalls of a tire for cuts or breaks. I've found that a large-size open-end wrench will do the job. If you have a pair of wrenches, you can leapfrog one over the other as you work your way around the circumference of the tire.

—Roger Moylan, Los Angeles.

Store garden hose in a basket

Though I've seen several methods for winter storage of garden hose in *Hints from Readers*, a method I've used successfully is coiling the hose neatly into a bushel basket and then hanging the basket with screw hooks from basement joists. If your basement has a finished ceiling, locate a spot on your garage collar beams.

—Victor Lamoy, Saranac Lake, N.Y.

'Brush' for painting borders

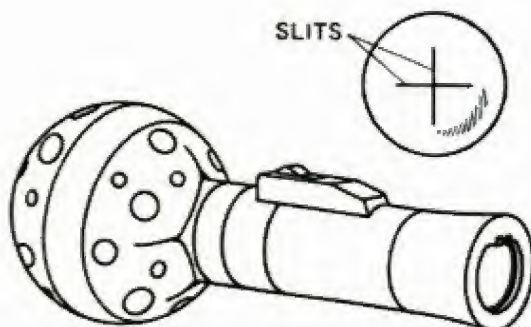
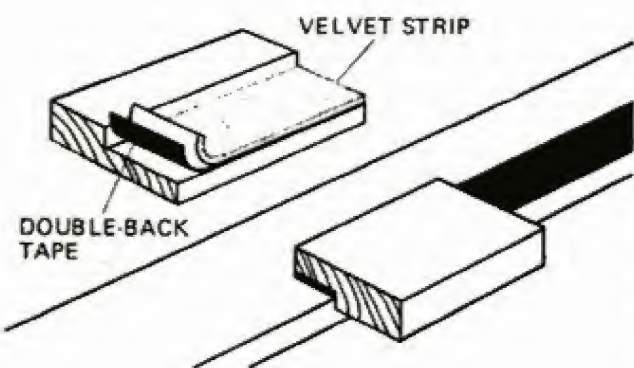
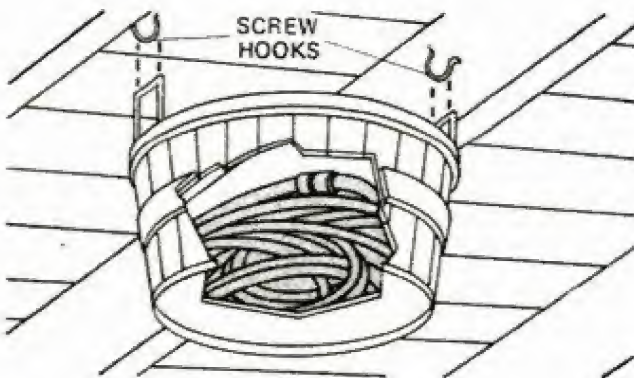
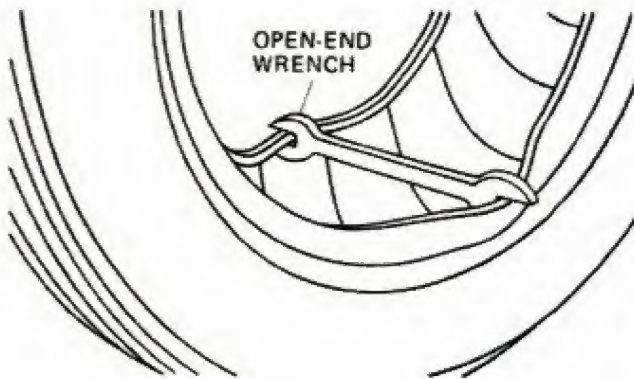
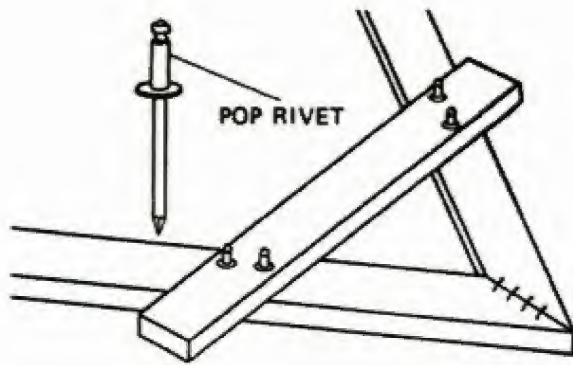
Straight (square-edged) borders—around picture frames, for example—can be painted without the fuss of masking tape by using this simple device. Make it from a wood block, strip of velvet and two-face carpet tape, and use paint sparingly. To keep paint from beading at the edge of the border, apply very little pressure.

—Richard Sturgeon, Kitchener, Ont.

Ball saves flashlight lens

The lens of a flashlight carried in a toolbox is likely to be shattered if it is made of glass, or badly scarred if it is made of plastic. Protect it by cutting intersecting slits in a cross shape in a hollow rubber ball of appropriate size and pushing the front end of the flashlight through the slits into the ball.

—John Krill, North Lima, Ohio.

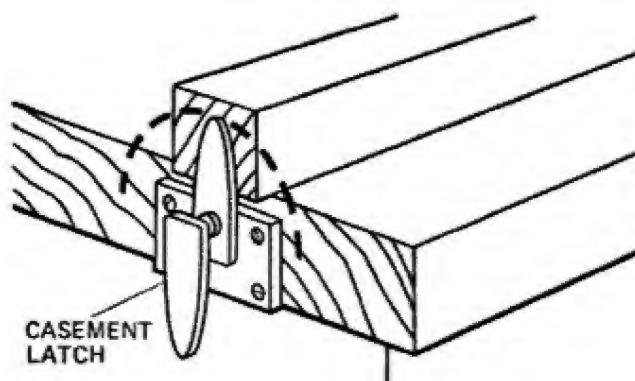


readers

Window latch is planing stop

For benchtop planing without a vise, or if your vise will not open far enough for the width of board you want to plane, attach a casement-window latch to the edge of your workbench to serve as a planing stop. Latch is simply flipped out of way when not in use. Casement latches are sold at most hardware stores.

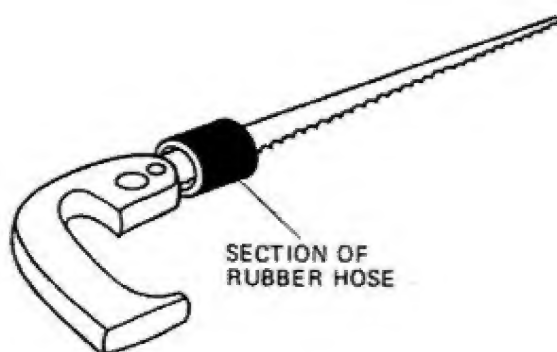
—Victor Lamoy, Saranac Lake, N.Y.



Hose section serves as 'cushion'

Even when cutting with care, it is easy to mar the work with the handle of a keyhole saw, or to bark your knuckles severely. I have found that a short section of old garden hose, slipped over the blade up against the handle absorbs any punishment should you accidentally strike the saw against the workpiece.

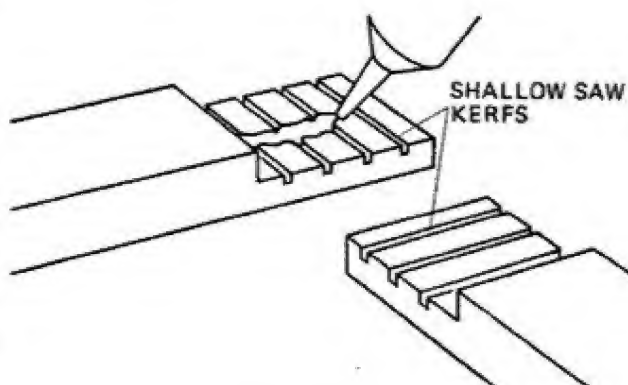
—Howard E. Moody, Upper Jay, N.Y.



Joint-gluing trick

A method I have used for preparing half-lapped joints for gluing and fastening is cutting shallow saw kerfs in the lap faces. Kerfs provide space into which excess glue can ooze, and, in my opinion, strengthen the finished joint. If edges of the frame will be exposed, the kerf holes can be filled and sanded smooth.

—Roger Moylan, Los Angeles.



Paint-can hold-down

A simple holder that will keep a paint can from accidentally sliding off your stepladder shelf can be improvised from a C-clamp and a large rubber band. Tighten the clamp to the shelf and stretch the rubber band around both the can and the screw shank of the clamp. If you don't have a large rubber band, cut one from inner tube.—Victor Lamoy, Saranac, N.Y.

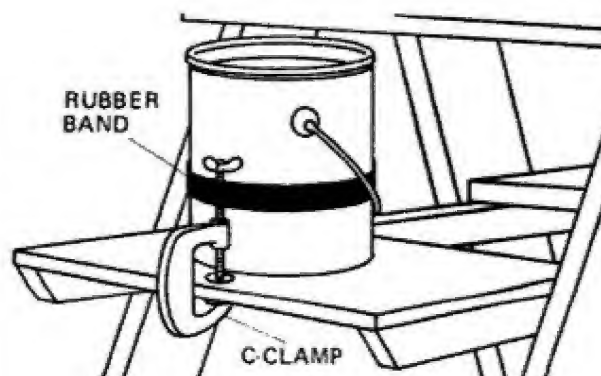
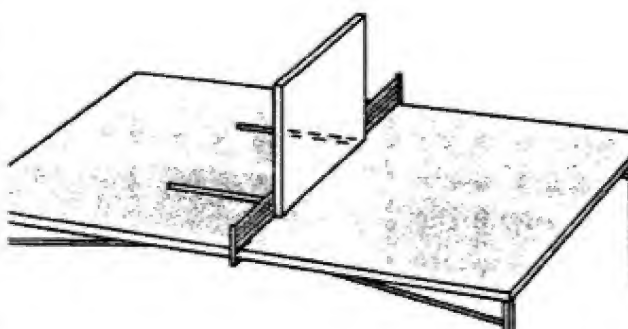


Table-tennis playback

Solo table-tennis practice is possible even if your table is not of the tip-up, "playback" type. To do it, set a card table on its side, with two legs extended on your table-tennis table. If you apply tape along the contact edge of the card table, the surface of the table-tennis table will be protected against scratches.

—Alex Jarett, St. Louis.



Ground-fault circuit interrupters—new protection against electric shock

They are required for outdoor and swimming-pool outlets and worth the investment for workshop or basement

By D. J. HOLFORD and HARRY WICKS



ON a warm Saturday morning, your kids head for your back-yard pool. About noon your wife decides to edge-trim the lawn with an electric edger. Later, you're cutting lumber with your portable circular saw (while standing on damp grass).

These are typical family activities on a weekend—yet three times different members of your family were exposed to the risk of serious electrical-shock injury and possible electrocution.

All it would take would be an insulation failure on a pool outlet, the edge trimmer or the electric saw. Should such a power leakage occur, the user himself becomes the route by which an electrical current will find its way from the tool to ground.

The National Electric Code as of Jan. 1, 1973, changes this picture. All 15 and 20-amp. outdoor receptacles in one and two-family dwellings must be equipped with devices called Ground Fault Circuit Interrupters (they are referred to as GFCI or GFI by the electrical trade).

GFCIs are also required for any receptacle within 10 to 15 ft. of a swimming pool, and all equipment used with storable pools must be on GFI protected circuits. (As of Jan. 1, 1974, GFCI's will be required for use

PROTECTED by Safety Sentry, a GFCI made by Rucker Electronics, homeowner safely cuts logs with electric saw

POPULAR MECHANICS



BRANCH CIRCUIT is completely protected when the breaker in service panel is GFCI type. Square D breaker (far left) takes up same space as circuit breaker it replaces. This manufacturer has models available for 15, 20, 25 and 30-amp. breakers

CIRCUIT BREAKER (near left) by General Electric has 5-milliamp. ground-fault protection, can be used to replace standard plug-on or bolt-on breakers. Available in 15, 20, 25 or 30 amps., 120-v., it has a 10,000-amp. interrupting capacity, push-to-test feature to provide verification of performance

Other types of interrupters



PORTABLE INTERRUPTER is designed for on-the-job ground-fault protection. Unit is simply plugged into power source, and tools plug into it. Model 1670 by Daniel Woodhead is claimed to be the most sensitive GFCI available. It trips on as little as 0.2 ma. of current



LOWEST-PRICED interrupter, Interrupter/15 by Pass & Seymour, is built into duplex receptacle, fits standard outlet box. Available in two models—dead-end protecting its own two outlets, and feed-through for protecting all outlets on same circuit (if installed in first box on line)



PORTABLE GFCI can plug into any 15-amp., 120-v. standard grounded receptacle to provide ground-fault protection; thus is ideal to keep in your toolbox for use with power tools indoors or out. It's GFP-115 by Harvey Hubbell. See chart on page 166 for complete list

Other portable interrupters



RAINFOOF OUTLET, Hubbell model GFA-315, can be mounted on any existing outdoor receptacle, but you should keep in mind that it has just one ground-fault protected outlet



INTENDED FOR CONSTRUCTION SITES, Harvey Hubbell portable GFCI, model GFP-201, is ideal when a number of protected outlets are desirable. Instructions for testing all units before use are clearly spelled out on labels

on 15 and 20-amp. circuits set up at construction sites.)

Stated simply, a GFI provides protection against serious injury or death caused by contact with damaged or defective electrical equipment such as those tool-insulation failures just mentioned.

And, according to electrical industry sources we have contacted, this is just a beginning. Most experts see a trend toward much greater in-home use of GFIs. It is expected that, eventually, similar devices will be required in kitchens, bathrooms and high-accident areas, such as workshops.

A wide range of the GFCI devices are already available, and on these pages we have listed those obtainable now at electrical suppliers.

What a GFCI does, basically, is compare the currents in milliamperes (ma.) entering and leaving a circuit; if they are not identical it means that some current is

leaking to ground. When the tool user is grounded, such leakage means severe shock at best, electrocution at worst. The GFCI upon sensing a leak trips the circuit and turns off the power within 25/1000ths of a second. That's not quite fast enough to avoid your feeling some tingling sensation, but it is fast enough to save your life.

(Once aware of leakage, you must check your electrical equipment to see if the insulation has broken down. If the tool proves to be okay, it means that the problem is in the wiring and you should call in an electrician to trace and correct the problem.)

Where should you install ground-fault protection? Ideally, throughout your house. But that could be expensive. A good rule of thumb is to install a ground-fault circuit interrupter wherever there is moisture present or grounded metal surfaces that the tool user may contact. In

short, those high-accident areas mentioned previously.

Total in-home protection is achieved by replacement of all circuit breakers with GFCI breakers. But, figured at roughly \$50 per breaker, the installation costs—even on a do-it-yourself basis—will escalate rapidly.

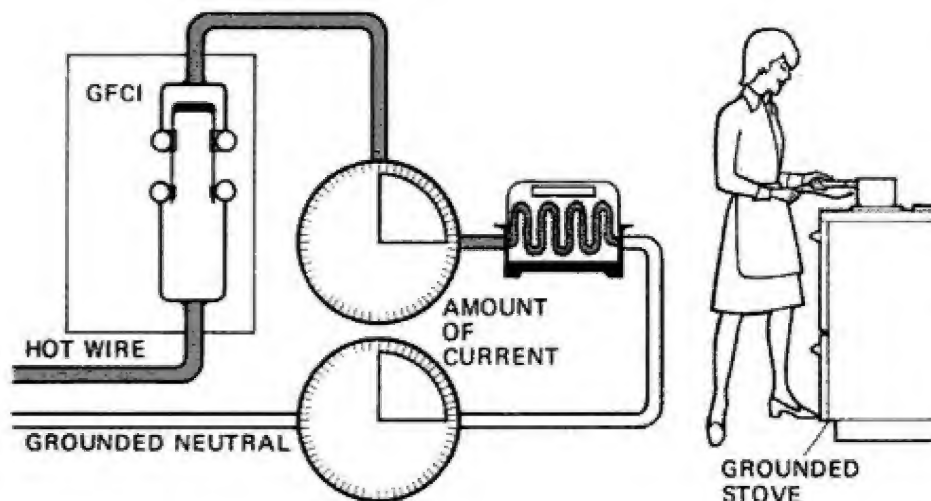
For openers, you should consider re-

placing your outdoor outlets with one of the weatherproof GFCIs that can be installed in place of an existing duplex.

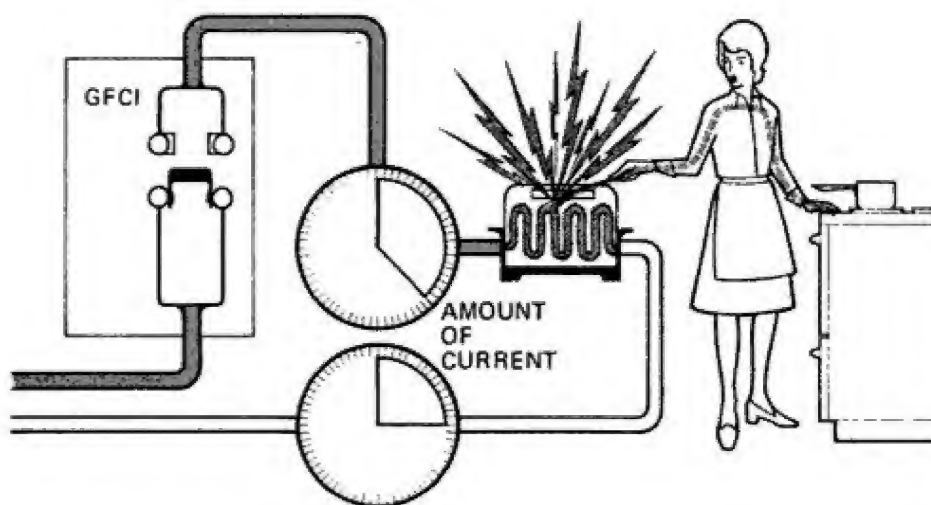
Or you can choose a portable type, which you can keep in your toolbox so it will be handy anywhere, indoors or out, when you have occasion to use any 110-v. power tool.

For indoor high-accident areas, consider

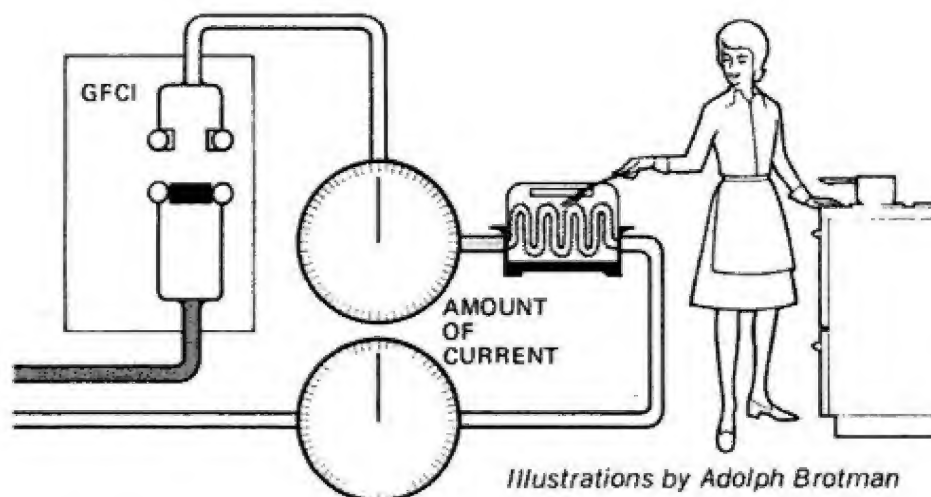
How ground-fault interrupter 'guards' circuit



1
SIMPLIFIED DRAWINGS at left show how a ground-fault circuit interrupter monitors current flow to assure equal current in the wires. Condition shown here is safe

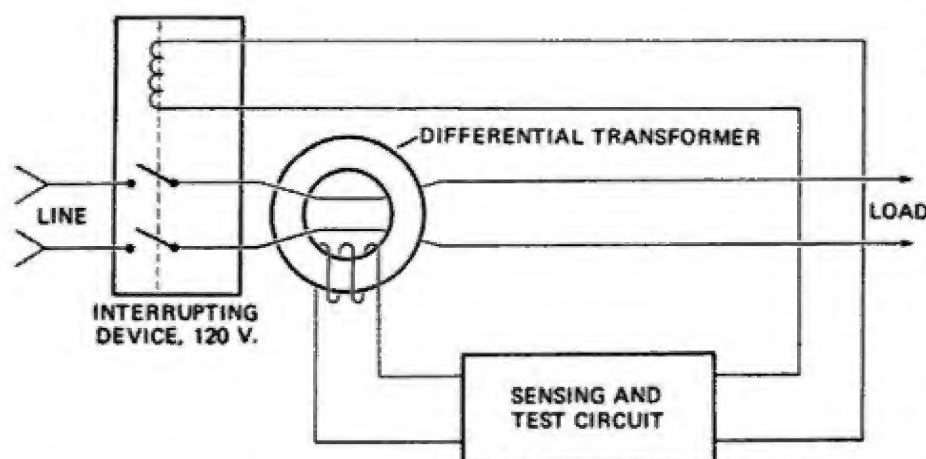


2
A GROUND FAULT changes current in one wire. Here, housewife wrongly poking a metal object into toaster creates a shock hazard—because she is "grounded" by touching a grounded metal stove. Upon sensing current difference, GFCI acts fast (trips) to shut off current



Illustrations by Adolph Brotman

3
GFCI cuts off the circuit completely to eliminate the shock hazard but 25/1000ths of a second after it senses a ground fault. Thus, the circuit interrupter is, in effect, a circuit "watchdog"



GFCI WIRING DIAGRAM

HOW IT WORKS

Current leaking to the ground on load side of a protected circuit causes imbalance in circuit, producing a change of flux in the magnetic core of the interrupter differential current transformer. This induces voltage in transformer's secondary windings that quickly actuates solid-state circuitry, causing circuit to open before any bodily harm can occur. Interrupter doesn't depend upon a third ground wire. The diagram is for Pass & Seymour's Interrupter/15

replacing receptacles with a GFCI built into a duplex receptacle. One version, the Interrupter/15 from Pass & Seymour, is offered in two models (both intended for 15-amp., 120-v. circuits). One type provides individual outlet protection (dead-end); for a couple of bucks more (see the chart below), you can buy a feed-through version that will protect the entire circuit when it's installed on the first outlet of the branch line.

If, as in most kitchens, the outlet is "split-wired," you cannot simply replace an existing outlet with a GFCI duplex. (A

split-wired outlet has a separate wire and fuse for each outlet, but they share the same return wire.)

To protect split-wired outlets, you will need a more expensive dual-voltage GFCI, or you must rewire the outlets for four wires and use two GFCIs for each one. This type of installation is best left in the hands of a licensed electrician.

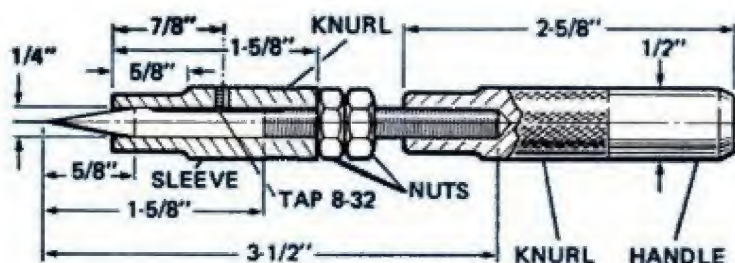
What it adds up to is that in terms of dollars and cents, GFCI protection is not cheap. But when you consider the safety you have provided your family, the devices are a bargain. ★★★

GROUND-FAULT CIRCUIT INTERRUPTERS—GENERAL INFORMATION

Manufacturer	Model No.	Type	Price*	Description
Harvey Hubbell, Bridgeport, Conn.	GFP-115†	Plug-in	\$50	Plugs into any outlet, provides one protected outlet.
	GFA-315	Outdoor outlet	\$43.50	Single outlet in rainproof box. Mounts on existing duplex outlet.
	GFP-201	Portable	\$184.75	Four outlets on the end of a 6-ft. extension cord. (Do not confuse with the GFP-221, which looks the same but has special 20-amp. plug.)
Pass & Seymour, Syracuse, N.Y.	Interrupter /15	Dual-outlet dead-end.	\$40.90	Replaces standard duplex outlet. Available in black, white, stainless steel. Rainproof cover available for outdoor use. Dead-end model protects its own outlets only. Feed-through model permits protection of all outlets on same circuit.
		Feed-through	\$43.90	
General Electric, Plainville, Conn.	CB3	Circuit breaker	\$45	Four models available with 15, 20, 25 or 30-amp. breakers.
Square D Co., Park Ridge, Ill.	QO115	Circuit breaker	\$45	Four models available with 15, 20, 25 or 30-amp. breakers. Kits available for outdoor use.
Daniel Woodhead, Northbrook, Ill.	1670	Portable	\$240	Two outlets and circuit breaker. Trips on 0.2-milliamp. leakage.
Rucker Electronics, Concord, Calif.	E103-15-A1	Portable	\$100	Four outlets and circuit breaker in box on end of 6-ft. extension cord.

*Prices approximate. †Available through Sears, Roebuck; all others at electrical distributors.
Note: Higher-power models are available in ratings up to 100 amps., which could handle a whole house.

Adjustable-sleeve punch you can make



FITTED with a sliding adjustable stop to control hole size, this unique hand tool lets you punch same-size holes repeatedly in sheet material with a tap of a hammer. It will produce holes ranging from a tiny pinprick to $\frac{1}{4}$ in. dia. in lightweight aluminum, tin-can stock or cardboard when the material is supported by a wooden block. In use, the sleeve limits point penetration, and is set for depth by tightening two hex jam nuts, which limit the sleeve's upward travel.

Begin by threading a $\frac{1}{4}$ -in. drill rod ($\frac{1}{4}$ -20 or $\frac{1}{4}$ -28 thread) as shown, and trim so that a $1\frac{5}{8}$ -in. unthreaded length remains. On the unthreaded end, form the conical point. Starting about $\frac{1}{8}$ in. from the point taper, file a flat extending to the thread for the sleeve setscrew. Then harden and temper the unthreaded section of the rod.

Make the sleeve and handle from $\frac{1}{2}$ -in. rod to the shape and dimensions shown. (Turning down of ends is for appearance; knurling is optional.) Both parts can also be hardened for maximum resistance to wear. At a point $\frac{7}{8}$ in. from the sleeve's smaller end, drill and tap for the setscrew. Drill and tap an axial hole in the handle to take the pointed rod to a depth of about $\frac{3}{4}$ in. For a tight fit, limit the threaded depth of the hole. The setscrew keeps the sleeve from slipping off.

—Walter E. Burton



THREADING A DRILL ROD is first step in construction of punch. To help keep the rod from turning when being threaded, place a spacer of the same diameter between the vise jaws at the opposite end. Annealing the rod first may be necessary for easiest threading. Center photo shows the finished parts of the punch and Allen wrench used to tighten sleeve's setscrew. At top, aluminum sheeting is supported over hole in wood block while being punched

SHASTA MOTOR HOME

(Continued from page 144)

the feel of the rig by remembering that its width is best gauged by the "California" side mirrors, each of which also has a convex wide-view mirror. These, too, have been included in all models as standard equipment.

We found the LP-gas space heater unsatisfactory. This "hot spot" unit puts out enough heat, but without a fan the floors are cold. The optional heater with fan is necessary. But thermostatically controlled ducted heat would make this an almost perfect year-around motor home.

Here's what owners say about their Shasta motor homes:

"In crosswinds it handles better than a pickup camper," says a Hornell, N.Y., factory supervisor. "I had a front coil spring break and the Ford dealer gave me static. He said that the chassis wasn't built for this use; that the spring was put on at the motor home factory. It took three weeks to get it all straightened out under warranty. It would have been a real pain if I was ready to go on vacation. . . . I wish the furnace had a blower; the floors are cold."

"I enjoy driving it more than our new station wagon," says a Portsmouth, Va., housewife. "My husband thought that with our three little girls it would be easier for me to drive this than pull our trailer. He was right; it's perfect for a woman driver."

"I traded a 28-foot trailer for the motor home because I had to buy high-priced cars to tow the thing," says a Gary, Ind., maintenance mechanic. "I look at tires and it seemed that Shasta put a decent tire on their rig." (Ford has 8.00 x 16.5 12-ply rated; Chevy has 8.75 x 16.5 10-ply rated.) I could have afforded something bigger, but I didn't want anything awkward."

"We love it," says a Canonburg, Pa., physician of his Ford Shasta. "I'm used to power brakes, but you have a lot more weight here and you have to really put your foot into it when you brake."

"I get about 10 miles per gallon at 50-55 with my Chevy. No complaints except the refrigerator pilot light blows out occasionally."—retired Navy man. "The airconditioning is wonderful," says a Portsmouth, Va., transportation foreman; "it cools all the way to the back of the coach. And my wife isn't afraid to drive this rig on the turnpikes." ★ ★ ★

BIG BANG ON THE BOARDWALK

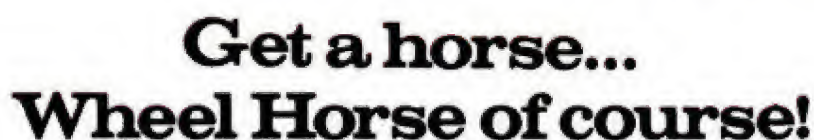
(Continued from page 125)

direction you want it to fall. Loizeaux knows all about trees because he was a forester before going into the demolition business—valuable experience that may well have contributed greatly to his skill as a precision blaster. He decides to go ahead anyway. An elaborate system of electronically timed charges is set to go off progressively—those farthest away from the annex first. Those nearest the annex are deliberately delayed to go off last. In addition, the annex end is shored up with heavy X-bracing to help keep it from falling seaward toward the gallery.

At 8:20 in the morning of last Sept. 29, the stage is set for one of the riskiest, most monumental demolition jobs ever undertaken. Loizeaux, his throat drier than wood planks in the nearby boardwalk, swallows hard and plants the palm of his hand against the detonator's twin firing buttons. There are two buttons to prevent accidental firing should one be touched inadvertently; both must be pressed simultaneously to trigger the blast.

The sequentially timed charges race through the building. Slowly the rear end begins to sag. The undercut is working. The first charges to go off are knocking out the back supports, forcing the structure to fall away from the sea. The towering wing starts to lean hesitantly as spectators hold their breath, then topples over like a giant redwood, its front overhang clearing the art gallery by a scant few inches. The last remnant of one of the nation's most glorious hotels lies sprawled in a heap of rubble.

Loizeaux smiles weakly in a mixture of sadness and relief. The Traymore is gone. Asked if he'd do it again, he replies, "Yes, and I'd do it the way I wanted to in the beginning—all in one shot." But there's no time to debate the point. While Loizeaux has been working on the Traymore, his sons have been wiring the aging 15-story Henry Grady Hotel in Atlanta for another shoot the following day. Then it's on to California the day after that to raze two old Swift meat-packing plants in Los Angeles. This will make a total of four major buildings in three days—a new demolition record and an accomplishment that has caused Loizeaux to be called "a destructive unit second only to the Eighth Air Force." ★ ★ ★



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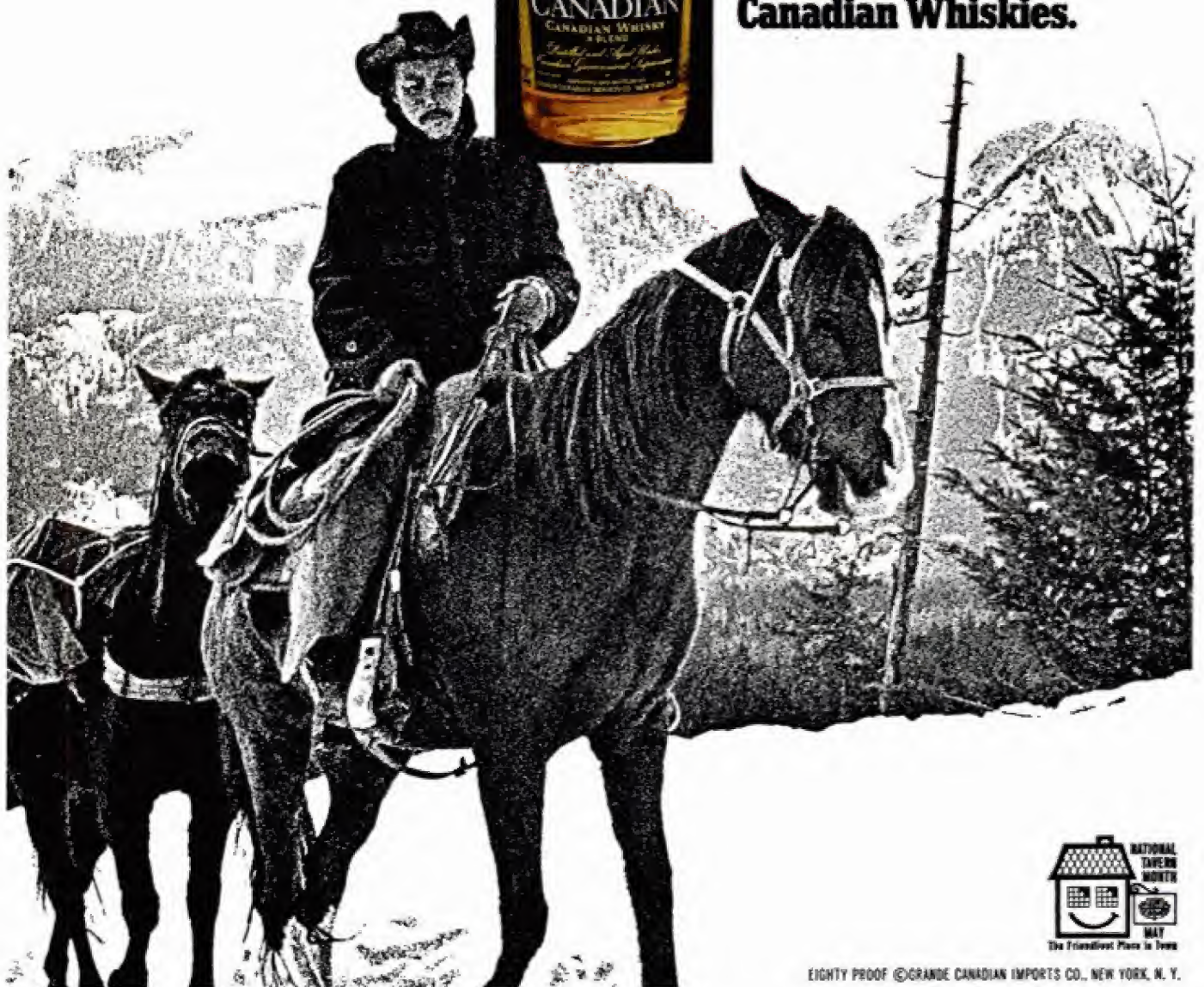
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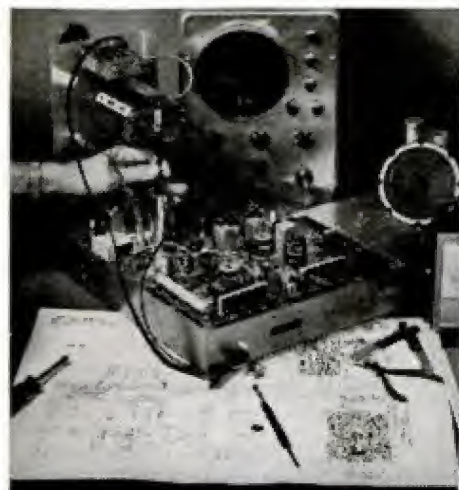
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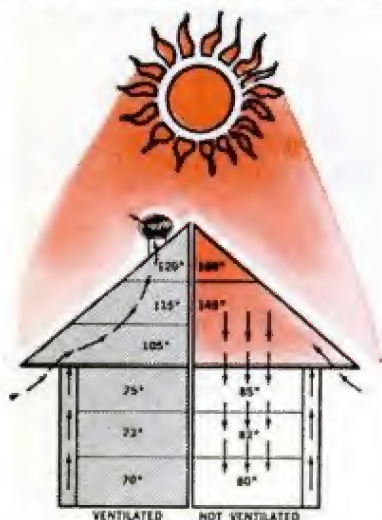
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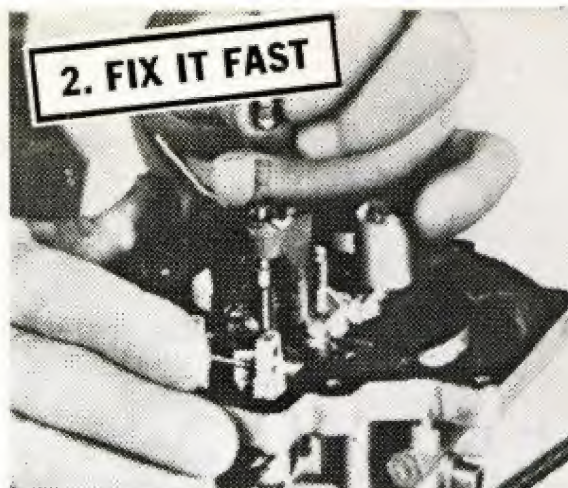
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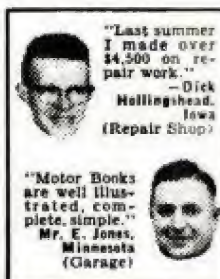


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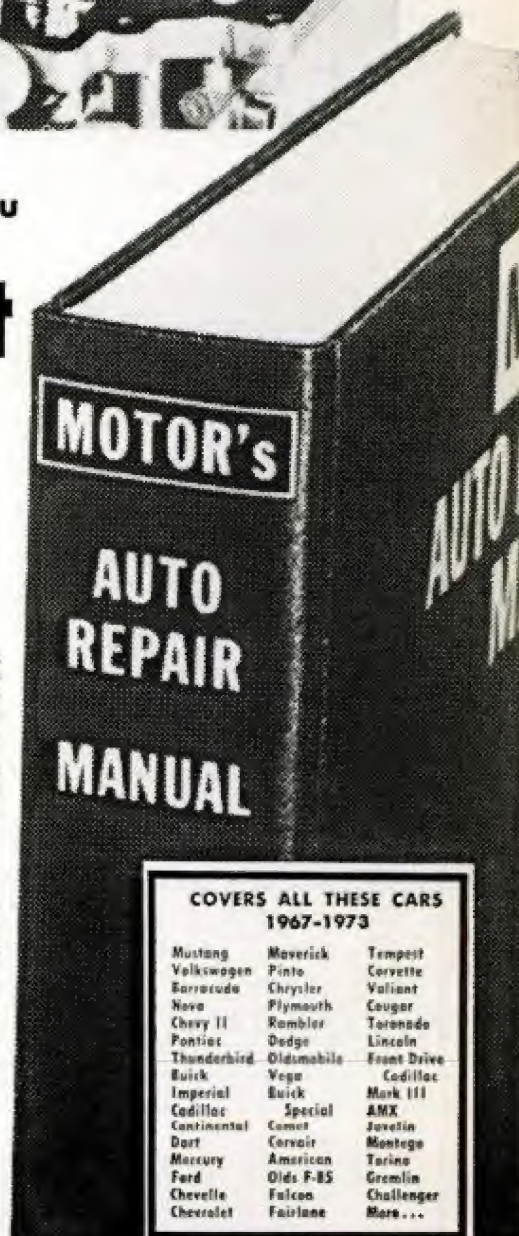
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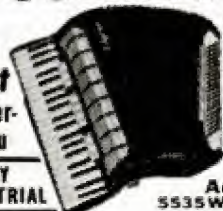
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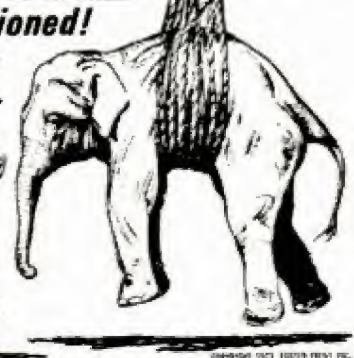
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Sears include a Front Touring Pack, which has two nylon-zippered compartments and a plastic map holder, for about \$13. It mounts on the handlebars. The Rear Pannier Pack has two 12 by 15 by 3-inch compartments and is priced at about \$17. The bright orange packs are made of lightweight oxford-weave nylon with leather trim.



A new three-compartment Bicycle Pannier from Gerry weighs only 2 pounds, 4 ounces. Made of 8-ounce nylon with urethane coating, it's a bright signal red, has a 2618-cu.-in. capacity, costs \$30. The maker is Gerry Div. of Outdoor Sports Industries, Inc., 5450 North Valley Hwy., Denver, Colo. 80216. ★ ★ ★

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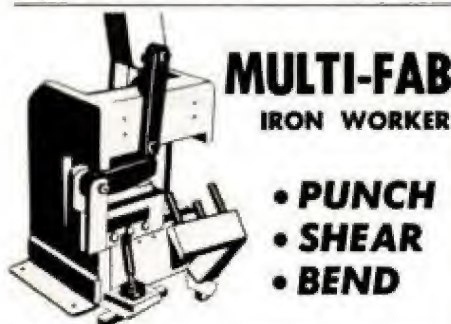
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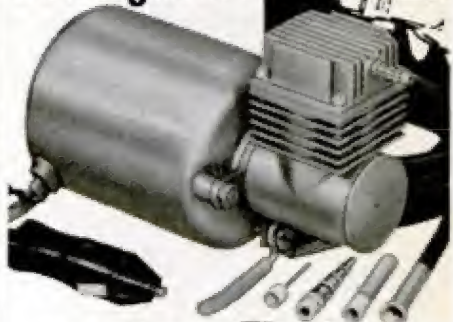
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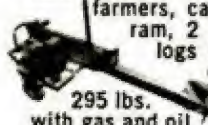
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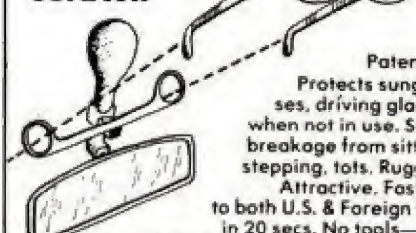
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(Continued on next page)

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(Continued from preceding page)

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(Continued from preceding page)

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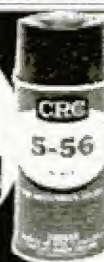
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When the funny stories you share are about your travels and not about your travel trailer, it was probably built with Starcraftsmanship.



There's something mechanical about the stories most people tell about their travel trailers.

Someone's heating system only worked on hot summer nights.

Somebody couldn't swing their legs out of bed without hitting the kitchen table. Very funny.

At Starcraft we think jokes like that are on the companies who build the travel trailers and we don't care to be one of them.

That's why we build our travel trailers with Starcraftsmanship.

Starcraftsmanship is our standard of excellence. Coming up to that standard has meant developing the leading research and design center in the industry—a center that can create trailers so complementary to your traveling lifestyle

you aren't even aware of them.

The Wander-Star is our biggest and most luxurious model. It's designed with enough space to carry a household of people and things all over the country. Without crowding out anybody's sense of humor.

If you want, you can get a model that has a forced air heating system that works like central heating.

And because some people think a shower means a light rain, you can also choose a model that has a bathroom complete with a tub.

The Wander-Star has a lot of attractive features. But more than the features and the quality materials we build them out of, Starcraft puts value in craftsmanship.

When we install carpeting, we don't come up an inch short under the bed.

When we put latches on the doors we open and shut the doors a couple of times to see them latch.

When we install a clock, it ticks. We're so serious about Starcraftsmanship it's almost funny.

But it's why we can afford to give the warranty on materials and workmanship that we do.

And why people who own Wander-Stars can tell you lots of funny things about their travels. But not lots of stories about their trailers.

We'd rather you laughed at our attitude and appreciated our travel trailers.

Write to us for more information on our full line of Wander-Star Travel Trailers. Dept. G27-5 Starcraft Company, Goshen, Indiana 46526



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